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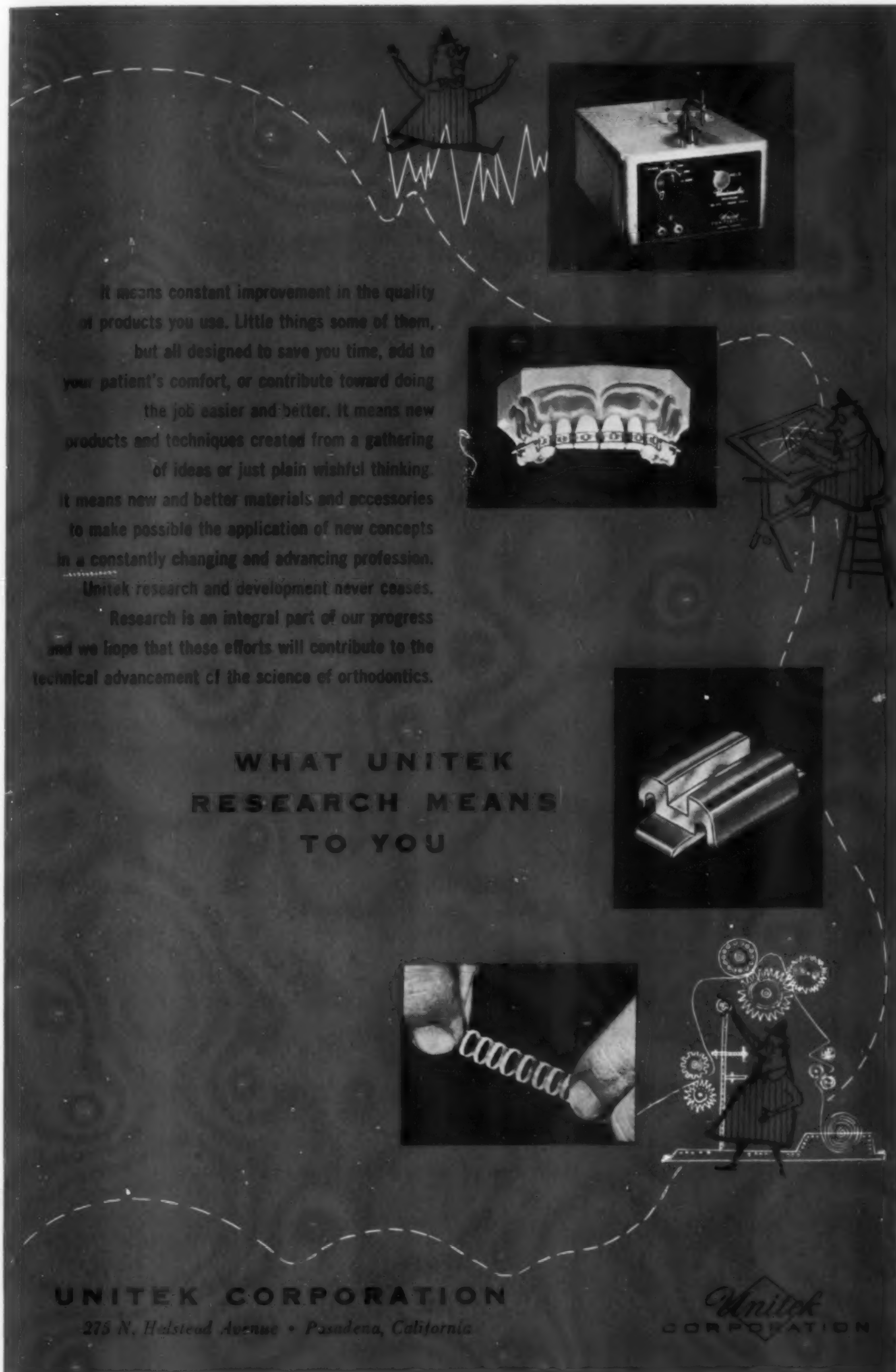
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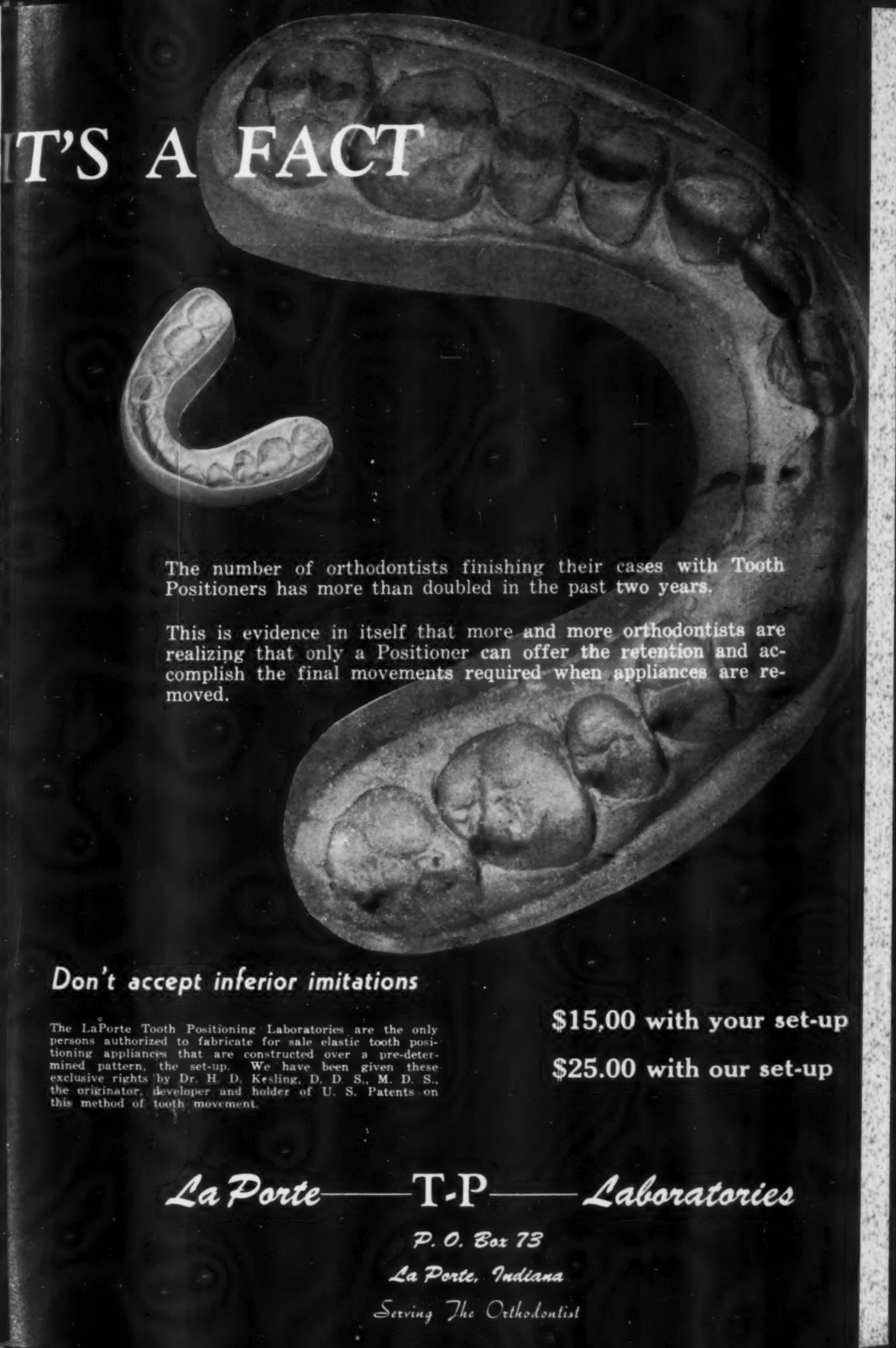
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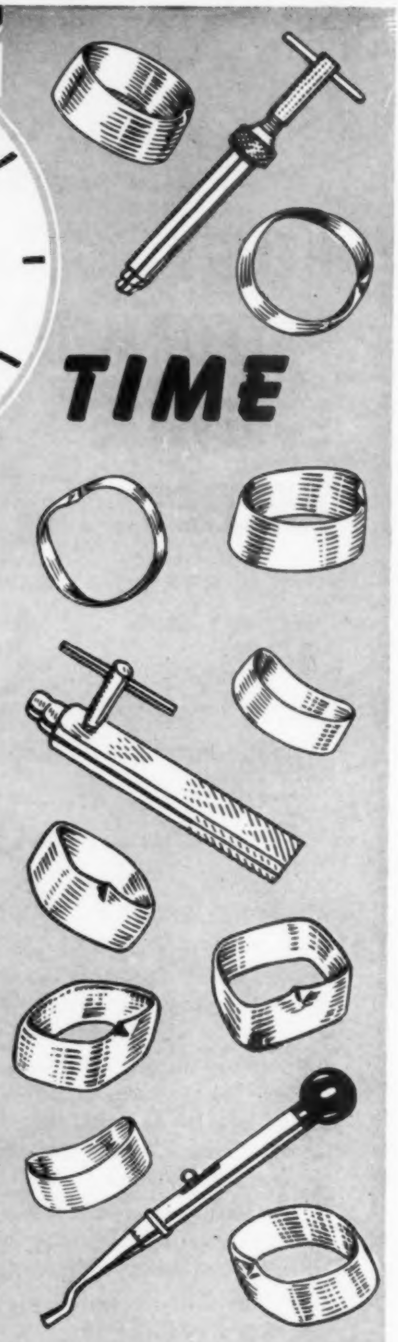

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American Journal
*of*
# ORTHODONTICS


VOL. 41 NOVEMBER, 1955 No. 11

## Original Articles

### ST. LOUIS AND EARLY ORTHODONTICS

H. C. POLLOCK, D.D.S., ST. LOUIS, MO.

INASMUCH as the Central Section of the American Association of Orthodontists is now meeting here in St. Louis, and for the added reason that much of the history of modern orthodontics was conceived and written here on the banks of Old Man River, your president, Dr. Shepard, and the chairman of your Program Committee, Dr. Brandhorst, asked me to say something about the St. Louis orthodontic story.

When that story began, the number of orthodontic specialists in the entire world could be numbered on the fingers of one hand. For those who are interested in the history of our specialty, here are a few all-but-forgotten facts about the birth of orthodontics in this city.

To begin with, the entire history is replete with orthodontic appliance groups living by labels. Then came the step-by-step composite thinking, running away from labels, and groups casting about, exploring practically all scientific health areas for something more solid than simple mechanical craft.

The history is inspiring with regard to the way men put appliances and skills together in the past and got such results that they attracted wide attention and that, fifty years later, the membership in the American Association of Orthodontists comprises approximately 1,600 men specializing in this particular field and making corrections for thousands of children.

These men accomplished what they did because of an enthusiasm that was nothing short of amazing. Some were inspired by pioneers whose devo-

Read before the Central Section of the American Association of Orthodontists, St. Louis, Missouri, October, 1954.

tion to the subject sparked others in the following generation. The same type of enthusiasm that inspired them with an example of courage and tenacity left a great impression on the subject.

Perhaps it would be a good idea to start the story with the Ninth Medical Congress held in Washington, D. C., in the year 1887. That was sixty-seven years ago; the blowing up of the Battleship Maine in Havana Harbor and the Spanish–American War were yet to take place.

Dr. B. W. Weinberger,[1] the orthodontic historian, reports that those in attendance were the authors, writers, and teachers of the subject of orthodontia—George C. Ainsworth, Edward H. Angle, Henry Baker, Fred A. Bogue, Calvin S. Case, John N. Farrar, C. L. Goddard, S. H. Guiliford, Victor H. Jackson, Norman W. Kingsley, C. W. McGill, and many others.

Among the papers read before that group was one by Edward H. Angle, professor of histology, comparative anatomy, and orthodontia at the University of Minnesota. It seems that this paper started something of an all-out hassle over the all-important question of the priority of usage of certain "regulating" appliances. According to Weinberger,[1] the Angle paper was "later published in the transactions of the 1887 meeting and was subsequently reprinted in Haskell's *Student Manual,* in the 1890 edition. Many regard the 1890 reprint of this 1887 paper as the first edition of Dr. Angle's book."

An impressive thing about looking in on past activities is that the subject of orthodontics has plainly enjoyed four different names during the last half century: (1) "regulation of the teeth," (2) "orthodontia," (3) "orthodontics," and (4) "dentofacial orthopedics." The *New Gould Medical Dictionary*[2] lists the subject officially as "orthodontics."

The American Association of Orthodontists adopted the name officially as "orthodontics." The Committee on Nomenclature of the American Dental Association also officially adopted the name "orthodontics" in 1954. Therefore, it would seem that the confusion of names in the written record of the subject of orthodontics should be a thing of the past.

In order to reveal some of the views of the past, let us take a look at some excerpts of the written record.

In the third edition of Angle's[3] book on regulation and retention of teeth, we read: "It is better to use cement in attaching the bands, although it is not necessary." In the same edition Angle, after describing the method of processing the headcap, for instance, says: "The patient will usually become tired of wearing the headcap and ask for its removal." (This reveals history repeating itself.)

The same edition describes what happens after extraction of the first premolars. It goes on to say that "by means of the traction screw 'the canines are drawn back distal to occupy the spaces formerly occupied by the first bicuspids.' " On page five of this edition, you may read "the requirements, sizes, and shapes of Angle Appliances are described as 'so perfect that we question whether they will ever be changed for the better.' "

It is interesting to note that Angle's third edition advocated, in some instances, the extraction of premolars previous to the so-called premolar-extraction wave started by the Calvin Case wing in the Gay Nineties, and precedes the present routine by about sixty years.

Dr. Angle subsequently came out with his dictum of the full complement of teeth, and proceeded with the indoctrination of all his students with the "orthodontists' first and most important lesson—the theory of the normal occlusion of teeth."

Now, let us get on with the interesting appliance themes that were then in full bloom. Ainsworth had an appliance. Henry Baker, of Boston, created the Baker anchorage (later known as the intermaxillary anchorage). Bogue, of New York, wrote much about his pet subject, the expansion of the deciduous dental arch. Calvin S. Case, a veteran teacher, author of a textbook, and leading figure, doggedly advocated the extraction of children's teeth as an aid to the correction of malocclusion. Angle came out with his celebrated classification of malocclusion. Case continued to teach orthodontics in the Chicago College of Dental Surgery, and he taught some of the largest classes graduating in dentistry in the entire world with the simple, but logical, theory that if there are more teeth in the dental arch than the alveolar process can accommodate, it then naturally follows that the proper treatment is to extract some of the teeth. Case was simple and direct in his pronouncements. A paradoxical situation existed, then, wherein the two leading teaching figures in orthodontics in America (living only 300 miles apart, in St. Louis and Chicago) were teaching graduating dental students opposite views about extraction of teeth as an aid to the correction of malocclusion. That was the situation existing at about the turn of the century, and obviously fifty-five years later the situation has not changed too much. Some still advocate extraction of premolars, some none at all, and others only as compromise treatment.

Farrar, Goddard, Angle, Guiliford, Jackson, and Kingsley were authors of textbooks. McGill created the McGill band; Victor H. Jackson originated the famous Jackson crib and wrote a comprehensive book about it. Kingsley created the well-known Kingsley splint and became an international figure in dentistry in cleft palate work. He painted in Italy, practiced orthodontics in America, and added an artistic touch to both his vocation and to his avocation. He influenced model-making in trying to make it an art.

In reading these pioneer texts, one cannot fail to gain the over-all impression that the thinking on the entire subject was based on a crafts and arts concept, and that specialization was not yet established.

One thing is certain—the leaders were casting about desperately to discover a scientific basis for the subject. They perceived early that craft was only a small part of the whole and that the subject deserved examination and study.

In dental schools, orthodontics was considered a rather weak appendage to mechanical dentistry—nothing more. The contentions of its supporters notwithstanding, it got little attention from the deans and faculties of that day.

### THE TURN OF THE CENTURY

Now comes the focal point, the turn of the century. Angle plainly was contending urgently that this new subject (the regulating of teeth) was entitled to a chair as a regular part of the dental curriculum. He tried to interest several schools—Northwestern, Pennsylvania, and Minnesota—and finally settled for Marion Simms College in the City of St. Louis. This idea of dental school teaching, however, had but a short life and failed completely. Finally Angle decided to abandon the whole dental school idea entirely, and organized his special private school according to his own individual ideas. He proceeded to teach the subject as he thought it should be taught in the Angle School of Orthodontia at the Academy of Science on Olive Street, in St. Louis, Missouri.

It is clear that Dr. Angle felt that orthodontics should become a specialty of medicine and not particularly a branch of dentistry. He obviously became prejudiced against dental education in general, and some of his writings plainly reflect that concept. This reveals some of the thinking that may account for the rather extraordinary shifts of scenery that took place about that time and shows why orthodontic training was confined to private schools, accompanied by more prestige than dental schools had ever enjoyed. The few leaders in orthodontic thought simply could not see eye to eye with the deans of dental schools of that day; in fact, orthodontic leaders plainly were intolerant of dental schools, and that attitude continued for many years.

Finally, after private teachers created the most vigorous specialty in all of dentistry, the attitude of the schools changed and orthodontics was given greater consideration. Now many put much stress on orthodontic education, and that is as it should be.

Appliance-mindedness was of the essence; the schools were the most important issue in the orthodontic scene, and men were labeled by the appliance they used rather than by any other talents. You could be a Jackson man, an Angle man, a Dewey man, a Brady man, or a "mail-order" man and no one was interested even in the slightest as to your dental alma mater. You were simply identified according to the label of your choosing and your orthodontic indoctrination.

Then came the great question of fixed verses removable appliances. The removable appliance men said that the fixed appliance crowd, with their grass line and brass, created septic, diseased, and unclean oral cavities. The fixed appliance men said that the removable gadgets were of little practical value because patients lost them and would not wear them regularly. Intolerance grew rampant. The same question, nonetheless with a new switch, was the order of the day: What kind of label do you wear?

Some other so-called systems besides those of Angle and Jackson were developed by Knapp of Minneapolis, Lukens of St. Louis, Brady of Kansas City, Missouri, and Canning of Denver; many lesser lights put appliances on the market to sell to the dental profession, and some of them developed quite a following.

Obviously, after some sixty-odd years have elapsed, there is still some slight divergence of opinion as to the relative merits of orthodontic appliances. A Jackson man wanted no part of Angle appliances at the turn of the century, and that worked both ways. Today the modified Jackson appliance, after a process of evolution, has evolved into the modified Crozat and Gore removable appliance. The traditional Angle system of yesterday, by a series of evolutionary steps, has evolved into the edgewise. The currently advertised Jackson base metal crib is the original Jackson appliance with very little modification, and so on with several others.

Let us go on, then, with the so-called St. Louis story, which has been all but forgotten.

1. The Angle School was founded here in the City of St. Louis around the turn of the century through the efforts of Dr. Angle and one of his protégés, Dr. Richard Summa. Sessions of the school were held annually here for a period of about ten years. Students from many countries in the world—Mexico, Canada, Australia, England, Ireland, Scotland, Germany, Austria, Spain, and others—took the course.

Dr. Richard Summa took an important role in the early teaching program of the Angle School, and he was a potent link as a pioneer in the teaching of the subject. Dr. Martin Dewey also did much of the teaching in the early sessions. After Dr. Angle retired from active practice, the school was then moved to New York City where it held one session; then on to New London, Connecticut, in 1911. Later Dr. Angle moved to California and the Angle School continued in California as the Angle College of Orthodontia and was later discontinued.

2. The American Association of Orthodontists was founded and held its first meeting here in St. Louis, Missouri, in 1901. It was founded by Richard Summa and Edward H. Angle. Angle was the first and second president of the A. A. O., Richard Summa did much of the organizational leg work, and continued to teach in the private school as well as at the University of Iowa in Iowa City, Iowa.

Here I would like to insert into the record the fact that Richard Summa—student, teacher, and scholar—had much to do with the early founding of orthodontic teaching and the American Association of Orthodontists here in St. Louis.

3. On account of an unfortunate split-up early in the life of the American Society of Orthodontists, the Angle group soon organized the Angle Society of Orthodontics, composed of its own graduates. The Alumni Society of the

Angle School of Orthodontics was then founded here in St. Louis just a few years subsequent to the time that the A. A. O. was organized, and for years this group was an important influence in orthodontic study, advance, and accomplishments.

4. The International School of Orthodontia was founded in St. Louis at a little later date by C. D. Lukens and B. E. Lischer, and remained here for only a very short period of time. This school was taken over by Drs. William Brady and Hugh Tanzey of Kansas City, Missouri. The school continued private courses for many years and was responsible for the start of many early practitioners in the practice of orthodontics. After the death of both Drs. Brady and Tanzey, the school ceased to exist and its alumni society "died on the vine."

5. The *International Journal of Orthodontics* was organized here in St. Louis in 1915 by the late Dr. C. V. Mosby of the C. V. Mosby Publishing Company, with an assist by your editor. The JOURNAL has never missed a month (even throughout three wars) of going to press in its nearly forty-one years.

6. The Dewey School of Orthodontics was organized in Kansas City, Missouri; later it was moved to Chicago and then to New York. The Dewey School also organized its own alumni association, which endured for many years and held annual meetings all over middle and eastern America. The alumni society ceased to function subsequent to the death of Dr. Dewey.

In addition to the American Association of Orthodontists, each one of these schools supported its own alumni society and the Angle School included several groups or divisions scattered over the United States. One of the most vigorous was the Eastern Society of Angle Graduates. It was discontinued in 1939 after contributing greatly to the steady advance of the new specialty. Its contribution of scientific studies was outstanding.

## THE RHINOLOGICAL INFLUENCE

Something important happened along about that time that seems to have been all but lost in the limbo, something that left a powerful impact on the new specialty. Older practitioners of both medicine and dentistry will remember the tonsillectomy and adenoidectomy boom that started about the first decade of the century. So far as children were concerned, hypertrophied tonsils and pulpless teeth were looked upon by some as the root of all evil. Some school physicians seriously reported, in the *Journal of the American Medical Association,* finding up to 60 to 70 per cent of young school children with diseased tonsils and adenoids. The "T and A" clinics held several times a week in various hospitals constituted a Roman holiday, with children lined up waiting for their turn long in advance. Even worse was the "tonsil day" held in smaller communities, where thirty or more children would be collected in a temporary hospital to be operated upon by a visiting otolaryngologist from the big city. This great tonsil wave was even carried out under

the aegis of a "public health program" and sponsored by overindoctrinated school authorities who meant well but were carried away with the fad, as is often the case in health service activities.

The attitude of parents (for which the medical profession was largely responsible) finally changed and things slowly leveled off. Those days, it is good to say, are over. As a result of the newer knowledge, the indiscriminate, unnecessary "T and A" operation fell into disrepute. In the revolt against "T and A" operations, the pendulum swung far the other way, as so often happens. Every practitioner, however, can recall instances in which the condition of a poorly nourished child in ill health changed rapidly and completely following a "T and A" operation. Sometimes the improvement was amazing; nonetheless, the routine, as usual, went out of bounds and became a subject of ridicule because of its excesses. The entire movement went overboard as so many medical discoveries, unfortunately, have the habit of doing before they level off to their real value as a health service. This was followed by the great extraction boom for adults, and that repeated much the same history.

About 1910 somebody conceived the idea that a great deal of nasal trouble was associated with narrow nares, deviated septa, high palates, and mouth breathing, and rhinologists said that if dentists could open and widen the nasal fossae in these cases, it would help. So the search was on to increase the width of the nasal fossae supplemental to the tonsil and adenoid operations. The orthodontists came into the picture and here was born the traditional adenoid and tonsil influence in orthodontic diagnosis and prognosis.

About this same time (on March 27, 1912) A. H. Haskin,[4] M.D., of New York, read a paper before the Section on Laryngology and Rhinology of the New York Academy of Medicine, entitled "The Relief of Nasal Obstruction by Orthodontia and a Plea for Early Recognition and Correction of Faulty Maxillary Development." (That was two years previous to the beginning of World War I.) The following short quotations from that Haskin manuscript show what the trend of thought actually was at that time.

Haskin wrote: "Through my former students I have seen a rather unusual and interesting class of cases and have become more and more interested in the results of orthodontia. I am firmly convinced of the great benefits to be obtained in suitable cases of nasal obstruction by proper orthodontic measures, and I feel that this work will eventually, of necessity, be added to the *equipment of the Rhinologist*. The question of nasal obstruction and its results is so far-reaching and touches so many branches of our profession that it is impossible to give in detail all the theories as to causation, effect, and treatment, in any one paper." He further said: "Of late years attention is being drawn more and more to the influence of the teeth upon the development of the anatomy of the face."

Haskin reported spectacular cases in which the maxillary arches had been vigorously widened by means of orthodontic appliances, with resultant relief

in nasal stenosis, widening of the nares, and many other improvements. This orthodontic work was accomplished mostly by Bogue, George Palmer, and Merritt, of New York, in an experimental way.

G. V. I. Brown, M.D.,[4] of Milwaukee, reported case after case, over a period of seven years, in which the maxillary arch had been vigorously expanded with spectacular improvement. Ketcham,[4] of Denver (orthodontist), gave a paper before the American Laryngological-Rhinological and Otological Society in Philadelphia, on May 15, 1912, and reported three cases properly documented and illustrated, revealing changes in the nares and floor of the nose.

Frederick B. Noyes,[4] of Chicago (an orthodontist), read a paper before the same organization, and at the same time pointed up the adenoids and tonsils, all the classical Class II malocclusion syndrome was revealed in Noyes.

The late Dr. Varney Barnes, of Cleveland (an orthodontist), reported a number of cases in which he claimed to have opened the median maxillary suture in younger children. Frederick Bogue, of New York, reported case after case in *Dental Digest* in 1912 and 1913, in which he claimed to have created spectacular width improvement on the deciduous dentures. Photographic evidence left little doubt that his claims were true. This Bogue work was later published in book form.

To cap off, *The Laryngoscope*[4] (an international monthly journal devoted to the diseases of the ear, nose, and throat) set aside the entire November, 1912, issue for what it called the "Orthodontia Number." This was the only journal, incidentally, in either medicine or dentistry before or since that time that ever devoted an entire issue to the subject of orthodontics as an important aid to health service in conjunction with rhinological treatment.

The net result of all these case reports by nose and throat specialists made a great impact on the members of the new specialty. Many conceived, as a result of all this evidence, that the field of orthodontics was destined to something much more important and comprehensive than the routine of correcting malocclusion of teeth for cosmetic and esthetic purposes.

This wave greatly inspired the urge for freedom of individual thinking, the desire to explore collateral fields, and the willingness to enter areas where fools walk in but wise men fear to tread. It prompted the earlier workers in the new specialty to allow their enthusiasm to have a free rein and their imaginations to dwell in a larger field.

That was about the time, too, that Dr. Charles Mayo of Rochester, Minnesota, came out with his plug for orthodontics in his Washington speech before the Academy on Stomatology of the American Medical Association. He said that "there is a great new specialty of dentistry that promises more to the real advancement of dentistry than dentistry has ever enjoyed heretofore and its name is orthodontia."

It has been my purpose to describe to you a few of the orthodontic waves that occurred at a time when this city was headquarters for all things orthodontic.

There was a small group dedicated to the proposition of making orthodontics an important department of the health services. Angle and Summa were the leaders, and their students consisted of Pullen, Young, Hawley, Ketcham, Lourie, McKay, Casto, Gorman, Shelden, Kemple, Stanton, Noyes, Wilson, Mann, Murless, Weinberger, Palmer, Mershon, Kelsay, Clapp, Ellis, Desnoes, Gruenberg, Oppenheim, Law, Cavenaugh, Dunn, and many others.

Any who are interested in further reading on the "Maxillary Suture Age of Orthodontics" are referred to the following index of the literature that was published about six to ten years after the turn of the century. This index is printed through the courtesy of historian B. W. Weinberger of New York.

*Literature Pertaining to the Opening of the Maxillary Suture*

Frenum Labium and Its Relation to Intermaxillary Suture. Ketcham, A. H. American Orthodontist, 1907, June, pp. 36-44.
Expansion of the Dental Arch and Opening the Maxillary Suture in Relation to the Development of the Internal and External Face. Pullen, Herbert A. Dental Cosmos, 1912, May, pp. 509-528; discussion, pp. 485-592. (Important.)
A Study of the Maxillary Sutures. Wright, C. H. Dental Cosmos, 1911, p. 633.
A Group of Deformities of the Nasal Respiratory Tract, Coincident With Dental Irregularities. Wright, G. H. Dental Cosmos, 1912, March, pp. 261-269.
The Influence on the Nose of Widening the Palatal Arch. Dean, L. W. J. A. M. A., 1909, p. 941.
The Relation Between Deviation of the Septum and Irregularities of the Teeth and Jaws. Black, N. W. J. A. M. A., 1909, March, p. 943.
Stenosis of the Nasal Cavity Caused by Contraction of the Palate and Abnormal Position of the Teeth. Pfaff, W. Dental Cosmos, 1905, pp. 570-573.
The Application of Orthodontia Principles to the Prevention of Nasal Diseases. Brown, G. V. I. Dental Cosmos, 1903, pp. 765-775.
Development and Surgical Relations of the Nose and Mouth. Brown, G. V. I. Iowa M. J., 1910, February, p. 373.
Dental Impaction and Preventive Treatment. Barnes, V. E. Dental Cosmos, 1912, January, pp. 1-21.
Rapid Separation of the Superior Maxillary Bones to Relieve Deflected Nasal Septum and Contracted Nares. Willis, F. M. Dental Cosmos, 1911, p. 784.
Spreading the Maxilla Versus Spreading the Arch. Ottolengui, R. Dental Items Interest, 1904, pp. 836-855.
Treatment of Irregularities of the Permanent Teeth. Angell, E. C. Dental Cosmos, 1860, May, p. 540, June, p. 599.
The Surgical and Therapeutic Aspect of Maxillary Readjustment With Special References to Nasal Stenosis. Brown, C. V. I. Dental Cosmos, 1909, pp. 7-17.
Clinical Results in the Surgical Treatment of Hare Lip and Cleft Palate. Brown, G. V. I. Dental Cosmos, 1908, pp. 124-140.
Nasal Occlusion and Septal Deviation in Their Relation to Antral Development and Facial Expression. Copeland, R. Dental Cosmos, 1903, p. 136.

Inasmuch as you are now attending the annual session of the Central Section of the American Association of Orthodontists we hope that you are interested in some of the high lights of orthodontics as it was about the turn of the century here in the City of St. Louis.

The nucleus of the modern specialty was started here by a small band of stalwart students who rallied about Dr. Edward H. Angle. That specialty has grown all over the world and, had it not been for this small band that started here in St. Louis and who were so devoted to the work, it is doubtful whether such a growth could have occurred in the space of fifty years.

One word in closing, lest we lose perspective: As one of your members who lived through the latter epoch of this era, I would like to remind you that just as good results were obtained in the treatment of malocclusion by

some of these pioneers at about the time of World War I as those seen today. The main difference is that there are many more good results today and they are secured with less manual labor but attract much less attention. Results formerly regarded as spectacular are now accepted as routine.

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# THE SIGNIFICANCE OF EARLY LOSS OF DECIDUOUS TEETH IN THE ETIOLOGY OF MALOCCLUSION

Anders Lundström, B.D.S., Dr. Odont.,* Stockholm, Sweden

THE relative significance of genetic and nongenetic factors in crowding and spacing, according to investigations that I have performed on 202 pairs of twins,[4] is shown in Fig. 1. Genetic and nongenetic factors seem to have about the same influence, perhaps with some preponderance for the former. Clearly, it is no simple matter to decide, in the individual case, whether crowding that appears after premature loss of deciduous teeth is due to this loss or whether a coincident hereditary influence is, in fact, responsible. Even if the crowding is localized to the second premolars, it cannot be excluded that, as such, it is genetically determined and that only its localization and degree are ascribable to the premature loss.

One difficulty in deciding the effect of early loss of deciduous teeth relates to the fact that tooth migration after such loss may be of a temporary nature. Rather extreme cases of this type have been published by Kantorowicz[2] and Seipel,[7] showing how a considerable loss of space occurring during the shedding period can be regained on eruption of the premolars. In order to ascertain the final effect of premature loss of deciduous teeth, it is necessary, therefore, to follow the case to the end of this period.

Systematic investigations of the relationship between premature loss and subsequent crowding of the teeth have been made by several workers, for some of which the size of the case series and the age at the final observation are given in Table I.

Table I

| AUTHOR | NO. OF CASES | AGE AT FINAL OBSERVATION (YEARS) |
|---|---|---|
| Ungar[9] | 292 | 7 to 9 |
| Schachter[6] | 130 | 11 to 16 |
| | 50 | 10 to 16 |
| Lundström[3] | 118 | 12 to 14 |
| Seipel[8] | 50 | 10 to 14 |
| Breakspear[1] | 100 | 9 to 11 |

It is difficult to judge the significance of the results obtained by Ungar[9] and Schachter,[6] since they made no quantitative evaluations. Moreover, the final observation of some patients was made too early. For the present author's

Summary of paper read before the Central Section of the American Association of Orthodontists, St. Louis, Oct. 4, 1954.

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subjects, not all early extractions were recorded, data being available only after the age of 7 years, from which time the children received regular dental attention.

Although the investigations of the influence of premature loss were not satisfactory in all respects, it probably is worth while to review them, especially the last three listed.

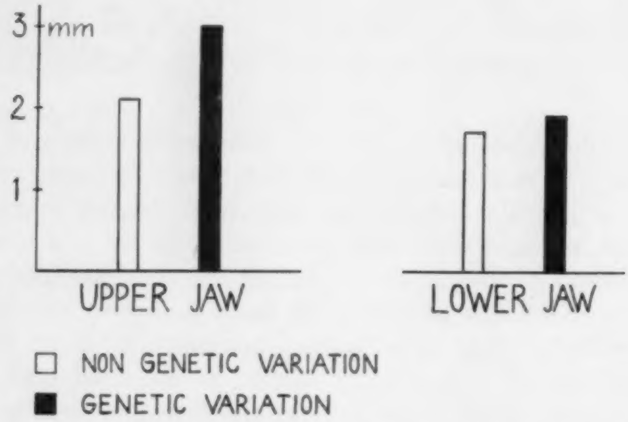


Fig. 1.—Histogram, showing significance of non-genetic and genetic factors to the space difference (see Fig. 2).

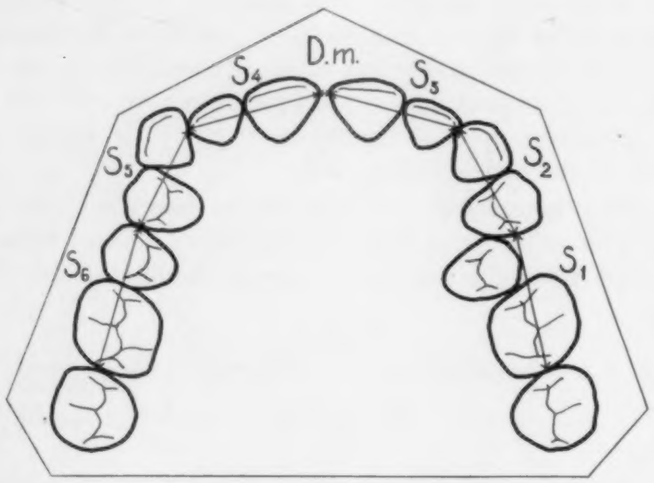


Fig. 2.—Degree of crowding or spacing is measured as a difference between the perimeter of the dental arch and the sum of individual tooth breadths. The perimeter is obtained by measuring the arch in six sections from $M_1$ on one side to $M_1$ on the other side.

I[3] made a statistical study of tooth spacing in each quadrant of the mouth, comparisons being made between cases with and cases without early loss of deciduous molars. Account was taken of the degree of crowding or spacing. A distinction was made between loss at 7 or 8 years of age and loss at 9 or 10 years of age, and between cases with a loss of the first or the second or both first and second deciduous molars. The degree of crowding or spacing was

measured in six sections around the dental arch, between the first molars on each side (Fig. 2). Crowding or spacing (CS) were expressed as a percentage:

$$CS = \frac{\text{space available}}{\text{sum of tooth breadths}} \times 100.$$

Jaw halves with first permanent molars extracted were not included. If permanent lateral incisors, canines, or premolars were missing, the CS value was calculated on the full complement of teeth, the missing values being obtained from the corresponding tooth on the opposite side; where the tooth was absent on both sides, the value was obtained from the ratio between adjacent teeth. Omission of such cases was impracticable, since most of them had teeth extracted because of crowding.

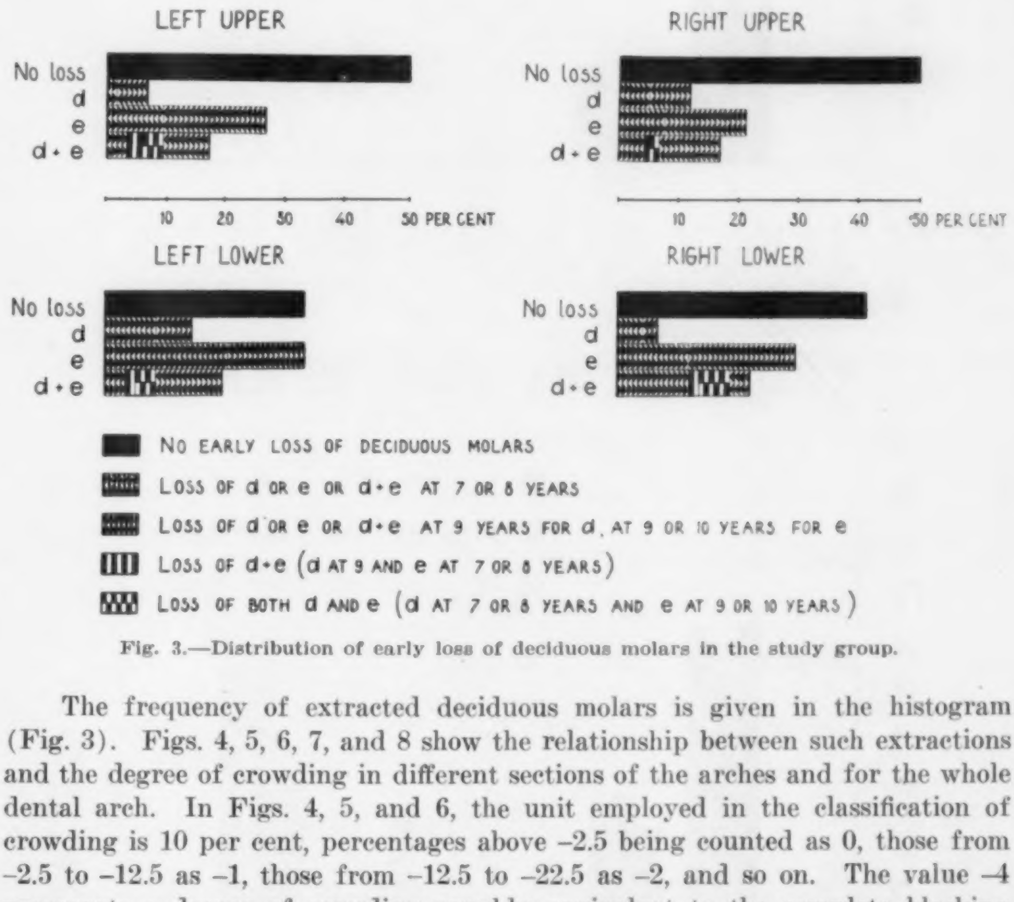


Fig. 3.—Distribution of early loss of deciduous molars in the study group.

The frequency of extracted deciduous molars is given in the histogram (Fig. 3). Figs. 4, 5, 6, 7, and 8 show the relationship between such extractions and the degree of crowding in different sections of the arches and for the whole dental arch. In Figs. 4, 5, and 6, the unit employed in the classification of crowding is 10 per cent, percentages above –2.5 being counted as 0, those from –2.5 to –12.5 as –1, those from –12.5 to –22.5 as –2, and so on. The value –4 represents a degree of crowding roughly equivalent to the complete blocking out of one second premolar. For Figs. 7 and 8, the unit of crowding is 4 per cent and the limit between 0 and –1 is given at –1 per cent. In this instance, the value –4 corresponds, roughly, to the blocking out of two premolars, one on each side.

The results suggest that it is particularly the earlier extractions that contribute to the development of crowding. It is evident also that, even in such

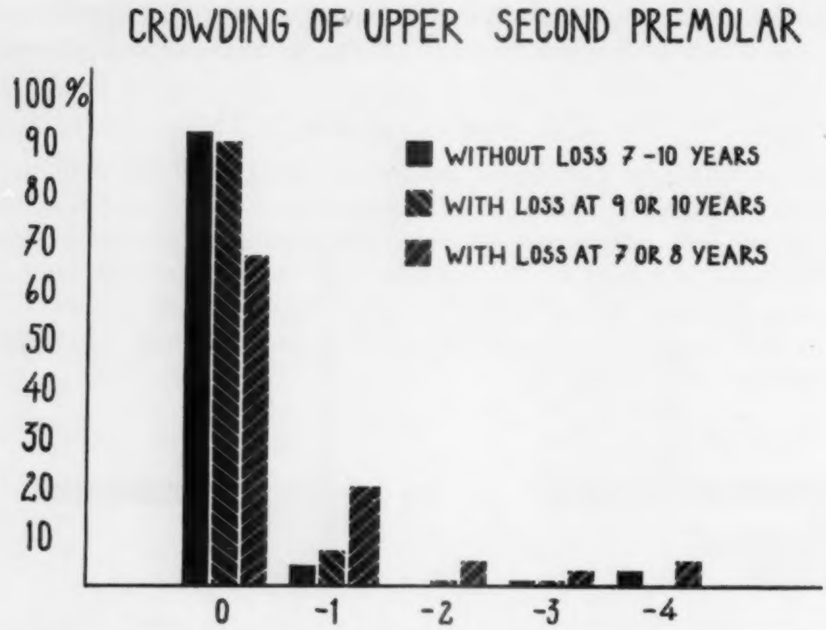


Fig. 4.—Association of crowding of the upper second premolar with recorded, early loss of deciduous molars (average of left and right sides). The degree of crowding was measured in sections 1 and 6, according to the method given in Fig. 2. Classes 1 to 4 correspond, roughly, to a crowding of one-fourth, one-half, three-fourths, and one premolar breadth, respectively (see text).

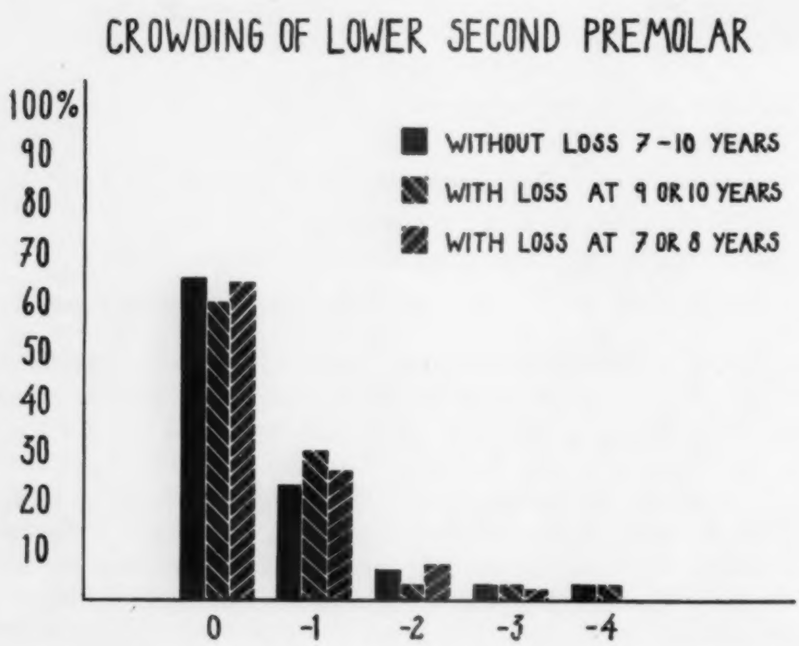


Fig. 5.—Association of crowding of the lower second premolar with recorded, early loss of deciduous molars (average of left and right sides). The degree of crowding was measured in sections 1 and 6, according to the method given in Fig. 2. Classes 1 to 4 correspond, roughly, to a crowding of one-fourth, one-half, three-fourths, and one premolar breadth, respectively (see text).

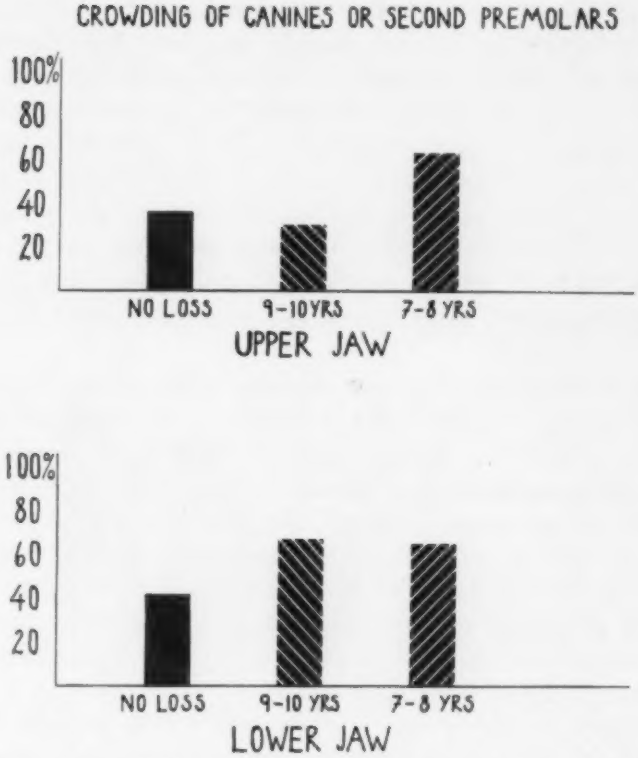


Fig. 6.—Association of crowding in the upper and lower canine or second premolar regions with recorded, early loss of deciduous molars.

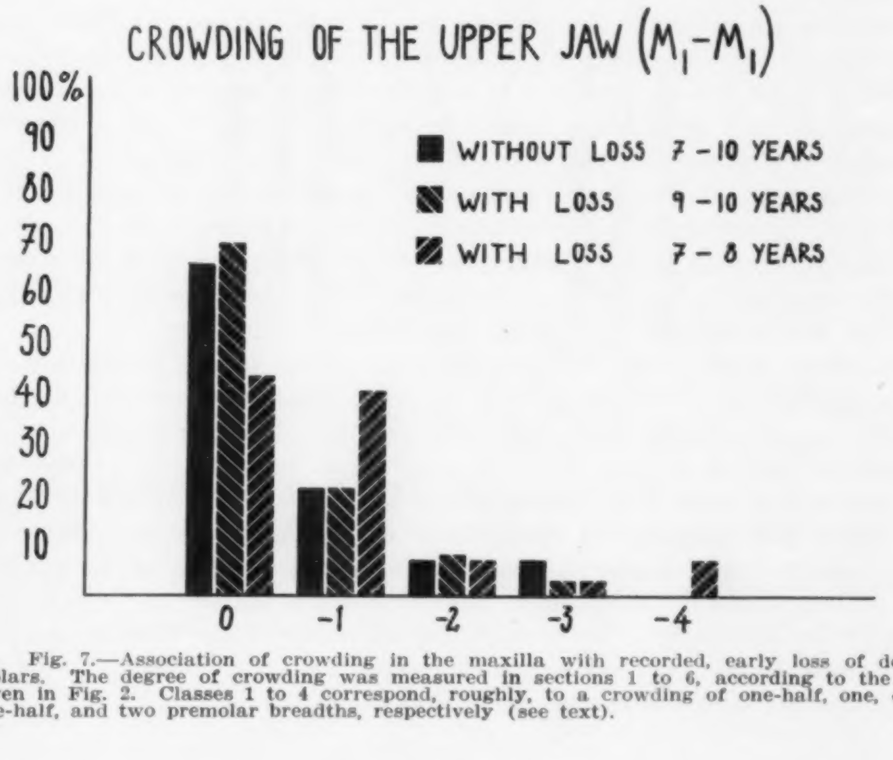


Fig. 7.—Association of crowding in the maxilla with recorded, early loss of deciduous molars. The degree of crowding was measured in sections 1 to 6, according to the method given in Fig. 2. Classes 1 to 4 correspond, roughly, to a crowding of one-half, one, one and one-half, and two premolar breadths, respectively (see text).

cases, it is not infrequent that normal spacing conditions eventually may be obtained. The reduction in normal spacing for the whole dental arch after extractions at 7 or 8 years of age appears to be about 22 per cent in the upper arch and 13 per cent in the lower. Otherwise expressed, it seems as if about one-third of the patients develop crowding in the maxilla and about one-fourth in the mandible as a result of such extractions. Reservations as to the general application of these figures must be made, of course, as the study group used may exhibit random deviations from the general tendency for the population.

A study was made of the effect of mandibular extractions on overbite and overjet. No significant increase of these characteristics could be demonstrated (Fig. 9).

Seipel[8] and Breakspear[1] demonstrated the effect of the early loss of deciduous teeth by comparing right and left sides in cases of unilateral extractions. This method may be justified, as appreciable midline shift is comparatively uncommon.[5] Breakspear's cases show greater migrations than Seipel's, which he attributes to the shorter interval before the final examination (9 to 11 years, compared with 10 to 14 years in Seipel's cases). As an expression of the final effect of early extractions, Seipel's investigation seems to be the more conclusive, even if some of his cases might have shown an improvement with a longer period of observation. Seipel's study group consisted of fifty children, in whom deciduous molars had been extracted at the early age of 3 to 5 years. The average loss of space on the extraction side was not more than 1.9 ± 0.3 mm. About one-fourth of the cases did not show any effect at all; one-half showed only a moderate effect (a loss of space of 1 or 2 mm.); and one-fourth showed a larger migration with a loss of space of between 3 and 7 mm.

To summarize, the early loss of deciduous teeth has no general influence on the development of the dentition. In spite of extensive and extremely early loss, the end result may be normal. As a matter of fact, the loss of space seems to be moderate in a great many cases. In some, however, we get a manifest and possibly a permanent effect. What is the cause of this difference?

The specific deciduous teeth lost constitute, certainly, one important factor. Breakspear's figures indicate a considerable difference between the loss of the second and the first deciduous molars, the closing of the space being more rapid and more complete in the former than in the latter case. The migration was also larger in the maxilla than in the mandible.

One other circumstance that contributes to the variations in migration is the intercuspidation. This may prevent the first permanent molar from drifting forward. In view of the intercuspidation and the possible migration on loss of deciduous teeth, it is clear that the eruption to contact of the upper and lower first molars is an important phase in the development of the dentition. Until the six-year molars have erupted, there is nothing but the presence of the permanent premolar germs to prevent the forward drift of these teeth. There is a considerable variation in the vertical position of the second premolars, at the same age. This variation could influence the forward drift of the first molars and thus may account for some individual differences in the development of malocclusion after early loss.

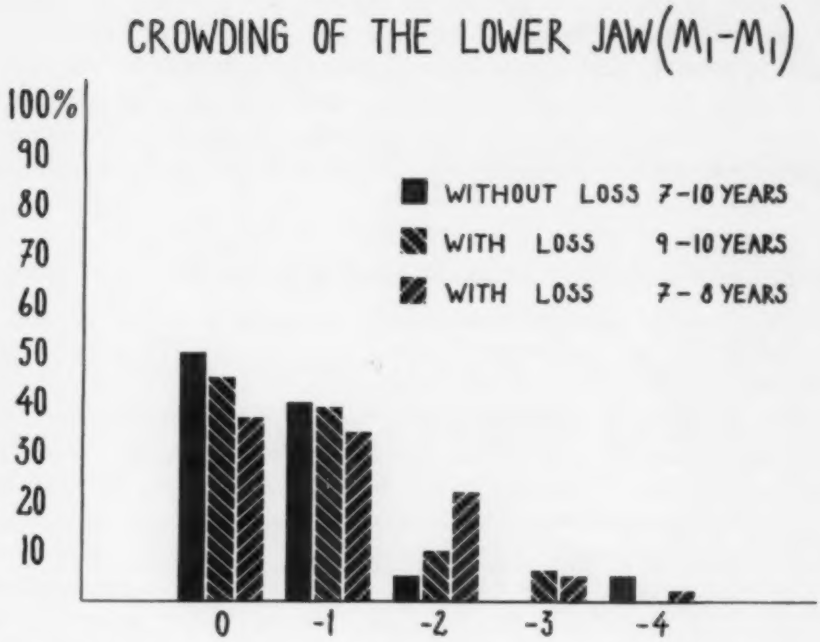


Fig. 8.—Association of crowding in the mandible with recorded, early loss of deciduous molars. The degree of crowding was measured in sections 1 to 6, according to the method given in Fig. 2. Classes 1 to 4 correspond, roughly, to a crowding of one-half, one, one and one-half, and two premolar breadths, respectively (see text).

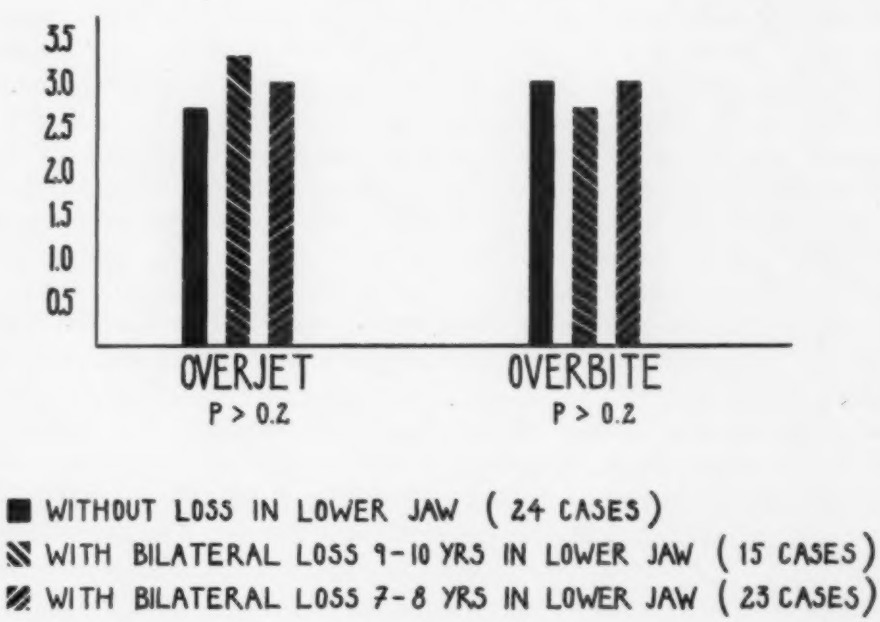


Fig. 9.—Association of overbite and overjet with early loss of deciduous molars in the mandible.

It seems probable, then, that relative arch spacing is the most important cause of differences in reaction to premature extraction. If there is a tendency to fairly large jaws, with normal spacing of the teeth or perhaps a slight overspacing, it is possible that extraction will have no influence at all. On the other hand, if there is a tendency to crowding and there is a certain amount of contact pressure between the teeth, an extraction probably can quite often produce a permanent closing of space, even in the total perimeter of the dental arch.

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# FACTORS DETERMINING ARCH FORM IN CLEFTS OF THE LIP AND PALATE

SAMUEL PRUZANSKY, D.D.S., CHICAGO, ILL.

TWO years ago, the first in a series of articles to emerge from the research studies at the Cleft Palate Center of the University of Illinois was presented before this society.[1] The purpose at that time was to establish a basis for future discussions by describing, classifying, and analyzing the various kinds of unoperated clefts of the lip and palate as observed in infants. In a sense, this first contribution was a theoretical paper, for no attempt was made to apply this new-found knowledge to the orthodontist's special problem of correcting the oral orthopedic deformity characteristic of these children. Since that time, a number of publications have appeared in an effort to apply the results of our investigations to the solution of various problems in pediatrics,[2] surgery,[3, 4] speech pathology,[5, 6] and dentistry.[7-9]

As the sum of our experience and knowledge in all matters pertaining to cleft palate increased, those of us who were charged with the responsibility of providing orthodontic services recognized the significance of the emerging concepts to our special field of clinical interest. It was on the basis of this newer knowledge that it became possible to plan orthodontic therapy in accord with the structural, functional, and psychosocial needs of the individual patient. The purpose of this article is to examine what has been learned so far in a frame of reference familiar to orthodontists, namely, the forces of occlusion. The operation of these forces will be revealed in the records from the longitudinal growth study that has been in progress at the Cleft Palate Center of the University of Illinois since 1949. A selected number of treated cases will be presented to illustrate the application of knowledge derived from studies on infants to the orthodontic treatment of older children.

A consideration of the anatomic and physiologic determinants of denture arch form in cleft palate was motivated by two desires: first, to remove some of the mystery and even fear of providing orthodontic treatment for the child with a cleft palate by dealing with the problem in terms already familiar to the orthodontist and, second, to reaffirm established principles by demonstrating their operation under unusual and vivid circumstances.

So much has been written about the forces of occlusion that it is difficult to present an original discussion. In a general statement on this subject,

From the Cleft Palate Center, Chicago Professional Colleges, University of Illinois, Chicago, Illinois.

Presented before the Northeastern Society of Orthodontists, New York, N. Y., March 7, 1955.

Angle[10] wrote: "Normal occlusion of the teeth is maintained, first, by harmony in the sizes and relations of the dental arches through the interdependence and mutual support of the occlusal inclined planes of the teeth; and, second, by the influence of the muscles labially, buccally, and lingually."

Strang,[11] Downs,[12] Newcomb,[13] and others have elaborated on Angle's concepts and they have enumerated the several factors that determine arch form and maintain the normal occlusion of the teeth. There is general agreement that it is erroneous to discuss each of these factors separately, and that, rather, we should keep in mind the interdependence of the several forces.

From what has been learned about the growth of the face and the eruption of the teeth, it is clear that the forces of occlusion are in a constant state of flux in the growing child and, further, that the growth potential is in itself an important determinant of arch form and occlusion. In our preoccupation with the measurement and analysis of growth of the face, it is sometimes forgotten that growth is not an immutable force that is expressed in a vacuum. Instead, growth takes place in a dynamic environment. If this environment should change, some equivalent change in the potential for growth is probable.

The facial bones grow in an environment that is strongly influenced by the forces emanating from the contractions of the muscles of mastication and facial expression. These forces are also operative in utero, a period of prolific skeletal growth. Any alteration in the symmetry or balance of these muscular forces will alter the direction and amplitude of bone growth. The expression of the growth potential may be likened to the movement of a metallic object through a field of electrical forces. By modifying the force field, the movements of the metallic object can be deflected in any direction. So it is with muscle tensions and their influence on bone growth. As the vectors of muscle pull are modified, there is a corresponding deflection in the course of bone growth. Therapeutically this concept is important, for it implies that, by removing obstacles within the environment, it becomes possible to free an individual for the full expression of his inherent potential for normal growth and development.

The dynamics of growth within an environment of changing muscle forces will be examined in the several kinds of clefts of the lip and palate in the expectation that a better understanding of the mechanisms by which the malocclusions are produced will lead to a sounder basis for therapy.

## CLEFTS OF THE LIP

The simplest kind of cleft to consider is that which is limited to the lip and alveolar process. Such clefts may be complete or incomplete. Complete clefts of the lip extend up to the floor of the nostril on the affected side and are associated with a complete cleft of the adjoining alveolar process. Incomplete clefts of the lip may extend in varying degrees from the vermilion border to the floor of the nose. Similarly, the associated defect in the alveolar

process will vary from a dimpled defect on its surface to a more extensive cleft. Clefts of the lip may be bilateral and symmetrical in that they are complete on both sides or else equally incomplete. Otherwise, bilateral clefts are described as being asymmetrical.

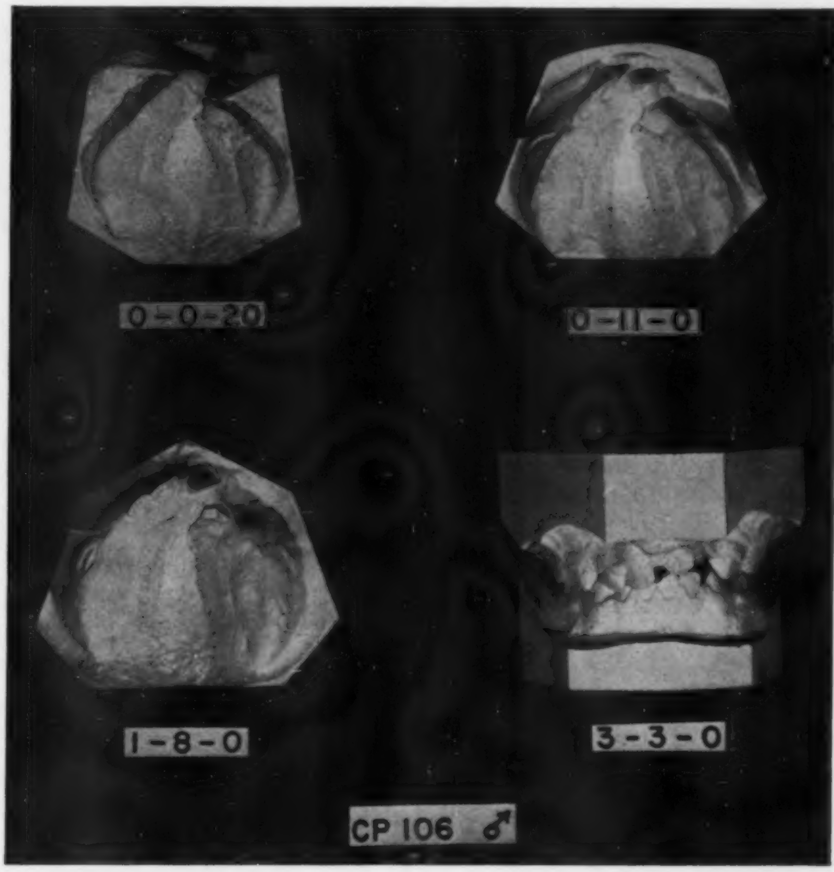



Fig. 1.—Serial casts of the maxillary arch of a left unilateral cleft of the lip and alveolar process beginning at 20 days of age and prior to lip surgery. The cast obtained at 11 months of age revealed the changes incident to lip surgery. The untreated malocclusion present at the age of 3 years 3 months is evident in the articulated casts.

In a unilateral cleft of the lip and alveolar process, the shape and dimensions of the maxillary arch, exclusive of the limited area involved by the defect, approximate the normal. The segment of the alveolar process medial to the cleft, commonly described as the premaxillary element, projects labially and is rotated toward the direction of muscle pull from the larger noncleft portion of the upper lip. Surgical repair not only restores anatomic continuity to the orbicularis oris muscle, but also changes the vectors of muscle tension upon the divided alveolar segments. Prior to lip surgery, the asymmetrical tensions pulled the bones apart but, after surgery, the lip molded the segments toward the midline (Fig. 1). In the majority of such cases, the associated malocclusion is minimal and confined to the area of the cleft in the alveolus.

Serial casts of an infant with a unilateral cleft limited to the lip and alveolar process on the left side were chosen to illustrate the development of the localized malocclusion characteristic of this type of defect (Fig. 1). The first cast was obtained prior to lip surgery, when the infant was 20 days old. The second cast in the illustration was obtained at 11 months of age and revealed the molding action of lip surgery upon the alveolar process. It should be emphasized that in this case, as well as in all other cases chosen for illustration in this article, no procedure other than repair of the lip was carried out by the surgeon. No mechanical or direct surgical procedure was employed to bring the palatal segments into closer approximation.

By 1 year 8 months of age, the lateral incisor in the region of the cleft had erupted within the palatal process on the side of the cleft and lingual to the central incisor. The central incisor adjacent to the cleft was malposed. The articulated casts taken when the patient was 3 years 3 months old revealed that the occlusion was excellent on the noncleft side as far as the midline. On the cleft side, the buccal segment including the canine was also in good occlusion. The anomalous positions of the central and lateral incisors bracketing the cleft could be explained on the basis of their location within malposed alveolar segments.

Where the position of these incisors posed a hazard to the arrangement of the opposing mandibular incisors, orthodontic intervention was recommended. However, orthodontic intervention was not recommended in this instance, as the localized malocclusion was not considered a serious impediment to dental and speech development. The limited advantages to be gained from orthodontic therapy had to be weighed against the psychological hazards engendered by subjecting a small child to excessive therapy.

The presence of supernumerary deciduous lateral incisors or malformed supernumerary teeth in the line of the cleft warrants observation. Because of abnormal inclined plane relations, such supernumerary incisors may disrupt the normal alignment of mandibular incisors. Further, the retention of these incisors may usurp space designed for other teeth in the maxillary arch. The extraction of malposed, malformed, supernumerary incisors in the line of the cleft is often a sound preventive measure.

In other instances, the indications for orthodontic intervention at a preschool age are definite and outweigh other considerations. An example illustrating the need for early therapy may be drawn from the serial records of a child with an asymmetrical bilateral cleft of the lip and alveolar process (Figs. 2 and 3). The anterior cross-bite produced by the lingual path of eruption of the maxillary incisors posed a hazard to the future alignment of the teeth in both jaws, interfered with mastication, and served as an impediment to the development of articulate speech. Accordingly, an acrylic bite plane was cemented on the six lower incisors in order to correct the malocclusion. The patient did not complain of any discomfort during the six-week period in which this appliance was worn. No retentive appliance was inserted and the correction remained stable.

Two questions arise at this point: How did this malocclusion develop in the first place? By what mechanism was rapid orthodontic correction achieved? The initial tracing of the series of cephalometric films of this boy (Fig. 3) revealed the vertical axial inclination of the crown of the maxillary deciduous incisor. Repair of the lip, performed in two stages (first on one side and then on the other), produced a lingual flexion of the slightly mobile premaxilla. As a consequence of this relative change in the position of the premaxilla, the

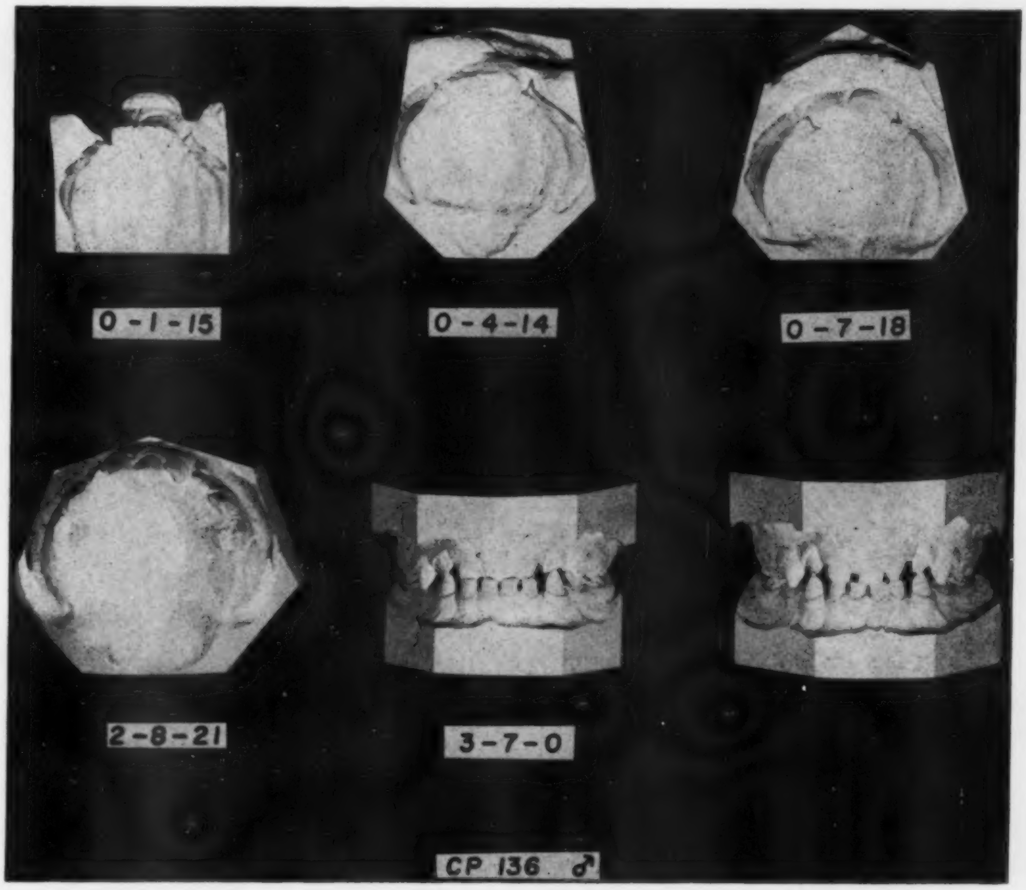



Fig. 2.—Serial casts of the palate of an asymmetrical bilateral cleft of the lip and alveolar process demonstrating the development of an anterior cross-bite and its correction. The initial cast at the age of 1 month 15 days preceded surgery. The second cast was obtained following repair of the lip on the right side and the third cast followed repair of the lip on the left side. The final set of articulated casts revealed the results of a brief period of orthodontic therapy.

central incisor crown assumed a lingual path of eruption apparent at 7 months 18 days of age. Although orthodontic therapy served to correct the anterior cross-bite, the cephalometric tracing revealed that further lingual root torque was essential to correct the axial inclination of the central incisor. It should be noted that the general development of the skeletal and soft tissue profile was well within normal limits.

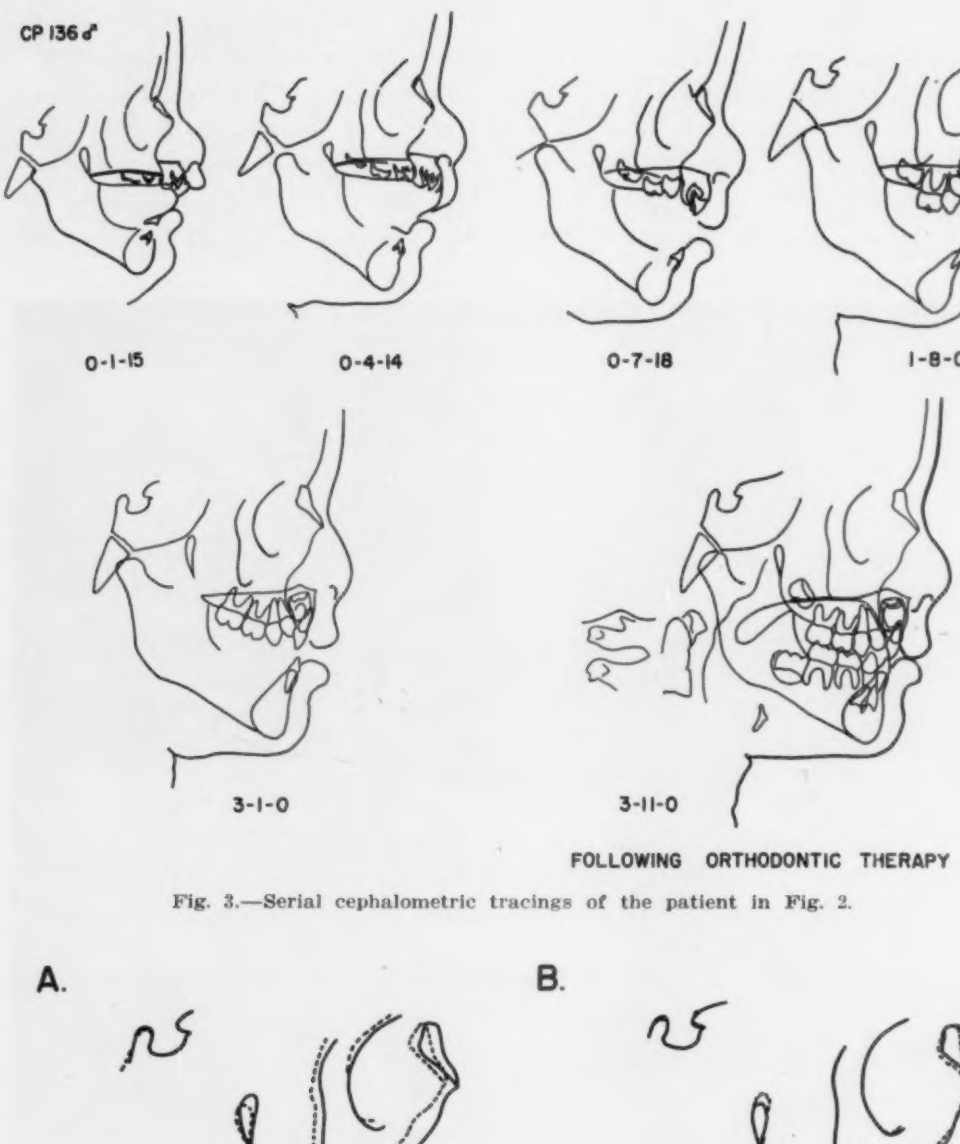



Fig. 3.—Serial cephalometric tracings of the patient in Fig. 2.

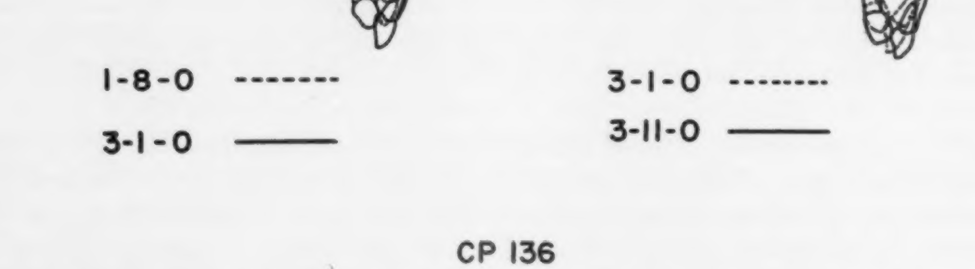



Fig. 4.—Tracings of the maxilla from Fig. 3 were superimposed on the sella-nasion plane with registration on sella. *A*, Changes incident to growth from 1 year 8 months to 3 years 1 month. *B*, Changes in the position of the premaxilla due to orthodontic therapy.

Superimposed tracings of the maxilla, employing the sella-nasion plane and with registration upon sella, revealed that the floor of the nose grew in a downward and forward direction in relation to the anterior cranial base (Fig. 4, *A*). When the tracing of the film obtained after therapy was superimposed upon the previous tracing (Fig. 4, *B*), it was apparent that the mechanism for rapid orthodontic correction resided in the ability to reposition the premaxillary bone. Essentially what the bite plane accomplished was to produce "labial torque" upon the premaxilla, thus elevating its nasal surface and protruding its labial aspect. Movement of the incisor within its alveolar process was of minor consequence in achieving the rapid correction of the cross-bite.

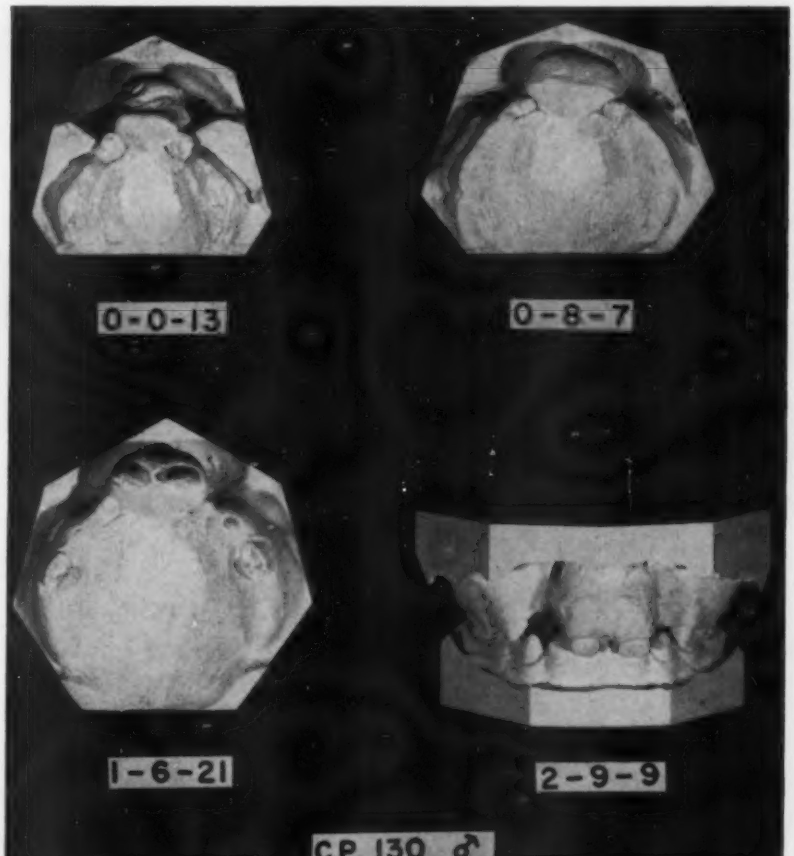



Fig. 5.—Serial casts of the palate of an asymmetrical bilateral cleft of the lip and alveolar process. Note the overjet and overbite produced by the projecting premaxilla.

Not all bilateral clefts followed a single pattern of growth, even though the same surgical procedure may have been employed in the reconstruction of the lip. In some, the presence of a large premaxilla produced a marked overjet and overbite in the incisor region (Fig. 5). Because of the cosmetic liability of this dysplasia, surgeons sometimes are tempted to extirpate the premaxilla or else to reposition it distally by the removal of a section of the

vomer. In our experience, such surgical maneuvers are rarely indicated and their practice may lead to serious intranasal and dental complications.[7]

Since the urge to do something about the projecting premaxilla is so compelling, it is important to recognize that the processes of growth operating in a new environment of normal muscle balance may lead to a slow but natural resolution of the skeletal deformity (Fig. 6). Serial cephalometric films have served to document Nature's way of minimizing the protrusiveness of the premaxilla. The downward and forward growth of the body of the maxilla and the mandible seems to catch up with the premaxilla which is now encompassed by the repaired labial musculature and held in rein by its tensions.

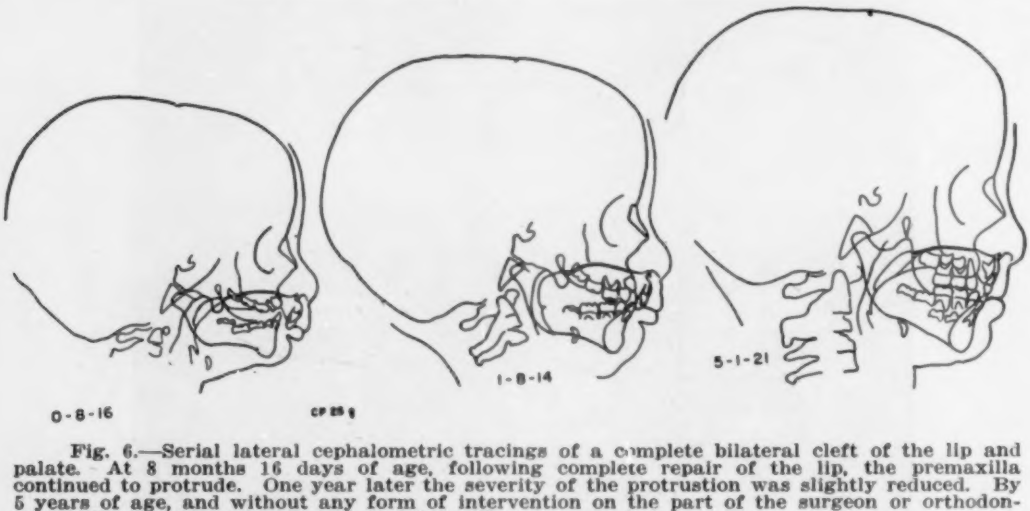



Fig. 6.—Serial lateral cephalometric tracings of a complete bilateral cleft of the lip and palate. At 8 months 16 days of age, following complete repair of the lip, the premaxilla continued to protrude. One year later the severity of the protrusion was slightly reduced. By 5 years of age, and without any form of intervention on the part of the surgeon or orthodontist, a dramatic improvement in facial profile was recorded.

Thus, the premaxilla becomes enveloped within the complex of facial bones to assume its proper architectural position. For some children this natural resolution of the dysplasia in the facial profile occurs rapidly, and for others the process evolves more slowly.

### COMPLETE UNILATERAL CLEFT LIP AND PALATE

For the sake of simplicity, discussion will be limited to the complete unilateral cleft extending from the lip through the hard and soft palates. In these cases the derangement in the palatal arch is characterized by the total lack of continuity of structure across the midline of the palate on the side of the cleft. The complexity of the spatial distortion can be appreciated by a comparison of a plaster reproduction of the palate of a 3-month-old normal girl with that of her twin brother born with a complete unilateral cleft on the left side (Fig. 7).

The transverse diameter of the maxillary arch was greater in the cleft palate than in the normal. The open cleft revealed that the inferior aspect of the vomer was horizontally disposed and deflected toward its attachment to


Fig. 7.—Plaster reproductions of the maxillary arch of a normal 3-month-old girl, and her twin brother with an unrepaired complete unilateral cleft of the lip and palate on the left side.

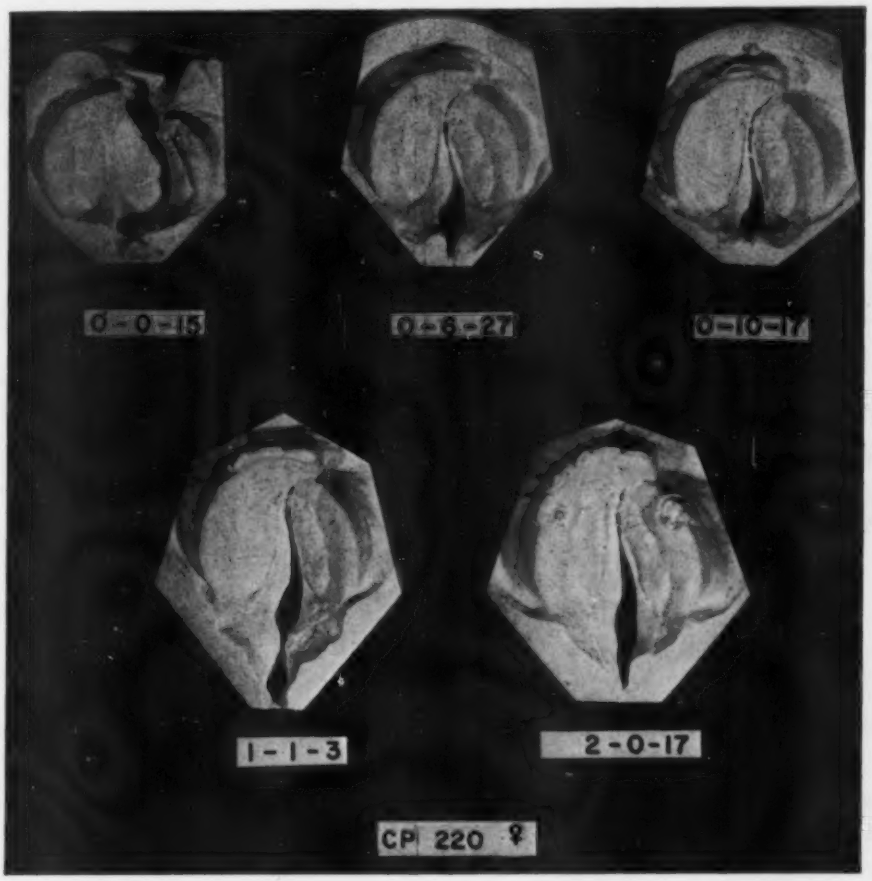



Fig. 8.—Serial casts of a complete unilateral cleft of the lip and palate. The first cast was obtained at 15 days of age, prior to lip surgery. The second cast demonstrated the approximation of palatal segments following lip surgery.

the palatal process on the noncleft side. Posteroanterior cephalometric films confirmed this observation and, in contrast, indicated that the nasal septum is perpendicular to the floor of the nose in the normal twin. The oral cavity communicated with the nasal chamber on the side of the cleft, exposing the inferior and middle turbinates in the plaster reproduction.

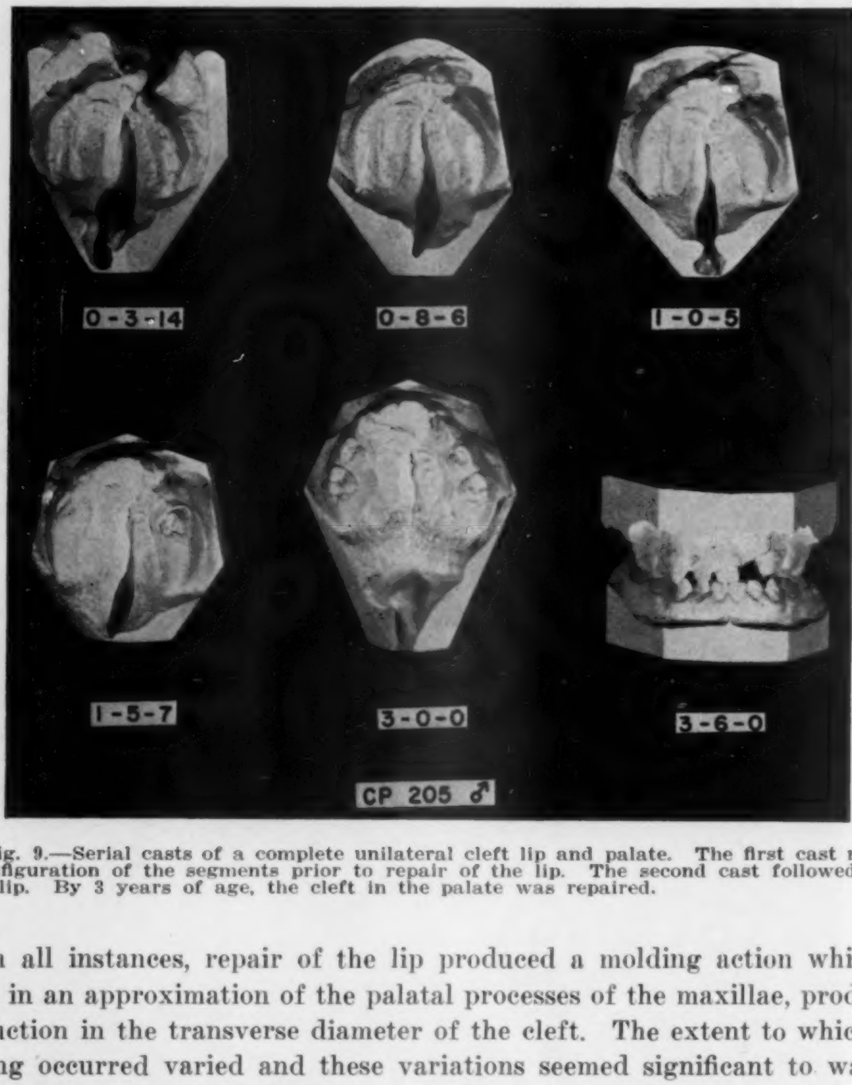



Fig. 9.—Serial casts of a complete unilateral cleft lip and palate. The first cast revealed the configuration of the segments prior to repair of the lip. The second cast followed repair of the lip. By 3 years of age, the cleft in the palate was repaired.

In all instances, repair of the lip produced a molding action which resulted in an approximation of the palatal processes of the maxillae, producing a reduction in the transverse diameter of the cleft. The extent to which this molding occurred varied and these variations seemed significant to warrant demonstration.

In the first series to be examined, the initial cast was obtained at 15 days of age, prior to repair of the lip. This record revealed a moderately wide cleft on the left side (Fig. 8). By 6 months 27 days of age, the results of lip surgery were such as to produce an overlap of the premaxillary element upon the palatal process on the cleft side. The transverse diameter of the palate became constricted in the caninė region, resulting in a marked asymmetry in arch

form. The palatal process on the cleft side was tilted medially and its anterior portion projected upward into the nasal cavity.

Subsequent casts revealed that continued growth of the palate and development of the alveolar process further increased the overlap and accentuated the containment of the smaller segment of the palate within the larger segment. It was apparent that the canine on the side of the cleft would erupt into extreme cross-bite relation. To a progressively lesser extent, similar occlusal relations would obtain for the deciduous molars on the cleft side.

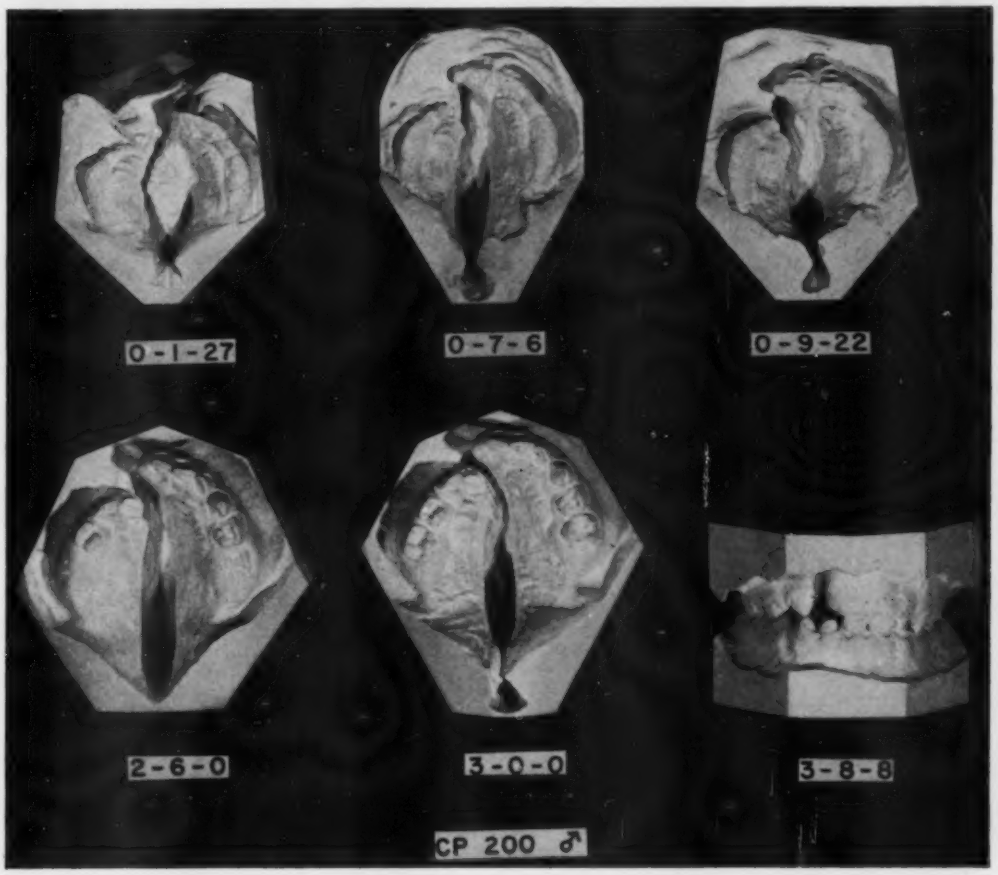



Fig. 10.—Serial casts of a complete unilateral cleft of the lip and palate on the right side. Note the gradual reduction in the width of the alveolar cleft with the continued molding of the lip and the growth of the alvelar process.

Also, any lateral incisor destined to erupt in this segment would be directed into the nose. It should be clear that the constriction of the maxillary arch as recorded herein could hardly be attributed to a growth arrest related to damage incurred during surgery, but must be viewed as a physiologic consequence of altered muscle forces acting across an unbuttressed palatal arch.

Since the roof of the mouth is also the floor of the nose, any derangement in the architecture of the palatal vault must be reflected also within the nasal cavity. Thus, on the side of the cleft, the nasal chamber was constricted in its

lateral diameters and the turbinates made contact with the septum to obstruct ventilation on the affected side. In view of the medial and upward tilt of the palatal process on the side of the cleft, the floor of the nose was elevated and the height of the nasal chamber reduced.

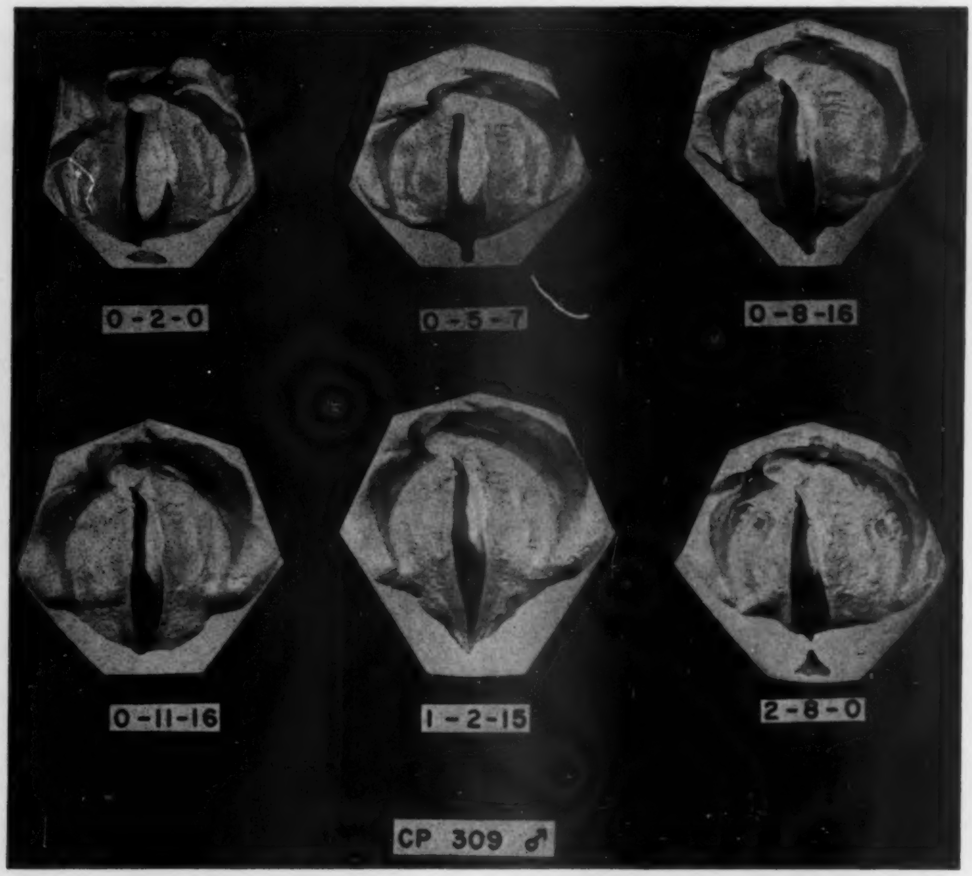



Fig. 11.—Complete unilateral cleft of the lip and palate on the right side. The first cast was obtained at 2 months of age, prior to lip surgery. The subsequent series of casts reveals the "slow-motion" overriding of one segment upon the other and the containment of the smaller segment within the larger segment of the palate.

In other instances, some overlap of segments in the alveolar region existed even prior to lip surgery (Fig. 9). In these cases, surgery of the lip accentuated the overlap and recontoured the lateral projection of the premaxilla. Palatal surgery was completed before this child reached the age of 3 years. The occluded casts obtained at 3½ years of age revealed normal occlusal relations on the noncleft side and cross-bite on the cleft side. The occlusal relations described for this patient are not a by-product of palatal surgery, but are related to the spatial configuration of palatal segments characteristic of this type of cleft.

The overlap of segments and the containment of the smaller segment within the larger do not always occur soon after lip surgery. In some, full

approximation of alveolar segments is achieved only through further development of alveolar process and eruption of teeth adjoining the cleft (Fig. 10). In others, the initial approximation of alveolar processes following lip surgery is in the form of a butt joint. Overlap follows thereafter as a study in slow motion geared to the growth of the alveolar processes and the progressive envelopment of the smaller segment (Fig. 11).

Sometimes the butt joint between the alveolar processes persists and no overlap follows (Fig. 12). Generally this phenomenon is related to the pro-

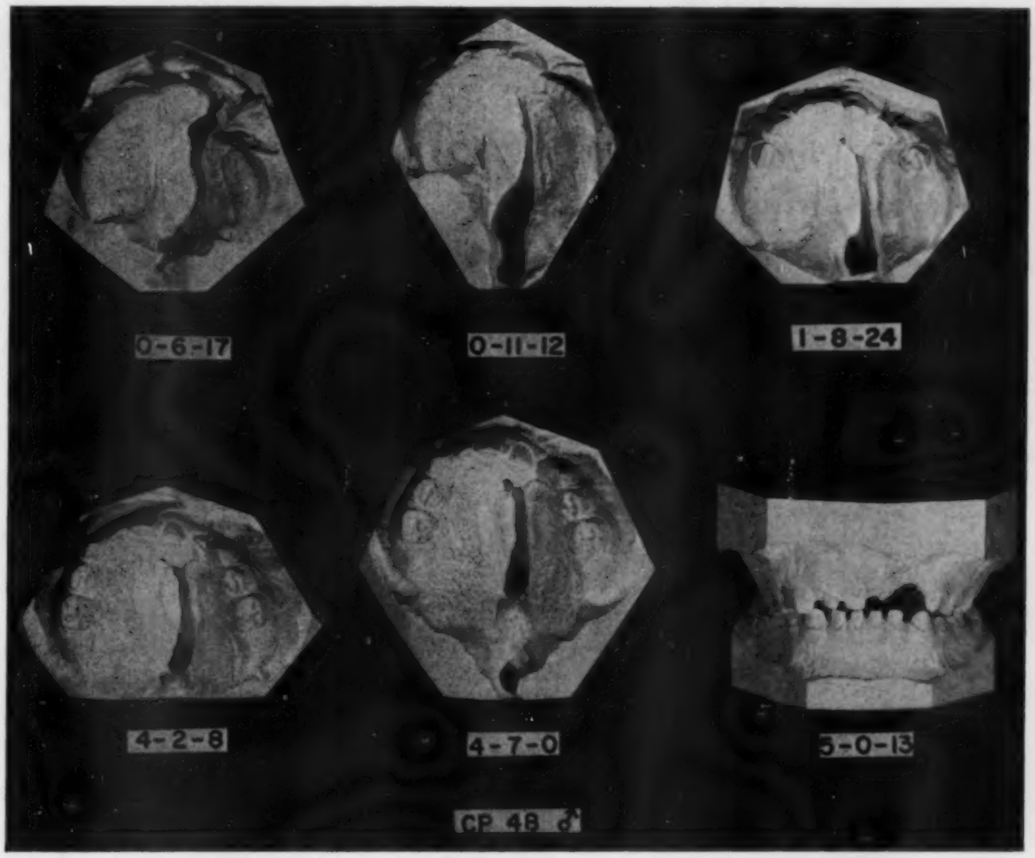



Fig. 12.—Serial casts of the palate of a patient with a complete unilateral cleft of the lip and palate. Note the formation of a butt joint in the region of the alveolar cleft following lip surgery and its maintenance through the prolific growth of alveolar process lingual to the upper left central incisor. The casts at the bottom were obtained following repair of the soft palate.

lific growth of alveolar process which prevented the overriding of one segment upon the other. In the case chosen for illustration, the exuberant growth of tissue lingual to the premaxilla served as an effective block to further medial movement of the smaller palatal process. As might be expected, the absence of overlap of alveolar processes was reflected in the occlusal relations, which were normal except in the limited area of the cleft.

Lest the novelty of the problem overwhelm our sense of judgment, it would be well to remember that a child with a cleft is first of all a child and, as such, is heir to the multitude of genetic, metabolic, and habit problems that affect other children. For these reasons, it was deemed advisable to insert into this discussion the casts of a child who had a unilateral cleft and who was also a thumb-sucker (Fig. 13). The anterior open-bite and the Class II tendency may not fit the cleft palate stereotype, but in our experience it is not an uncommon finding.

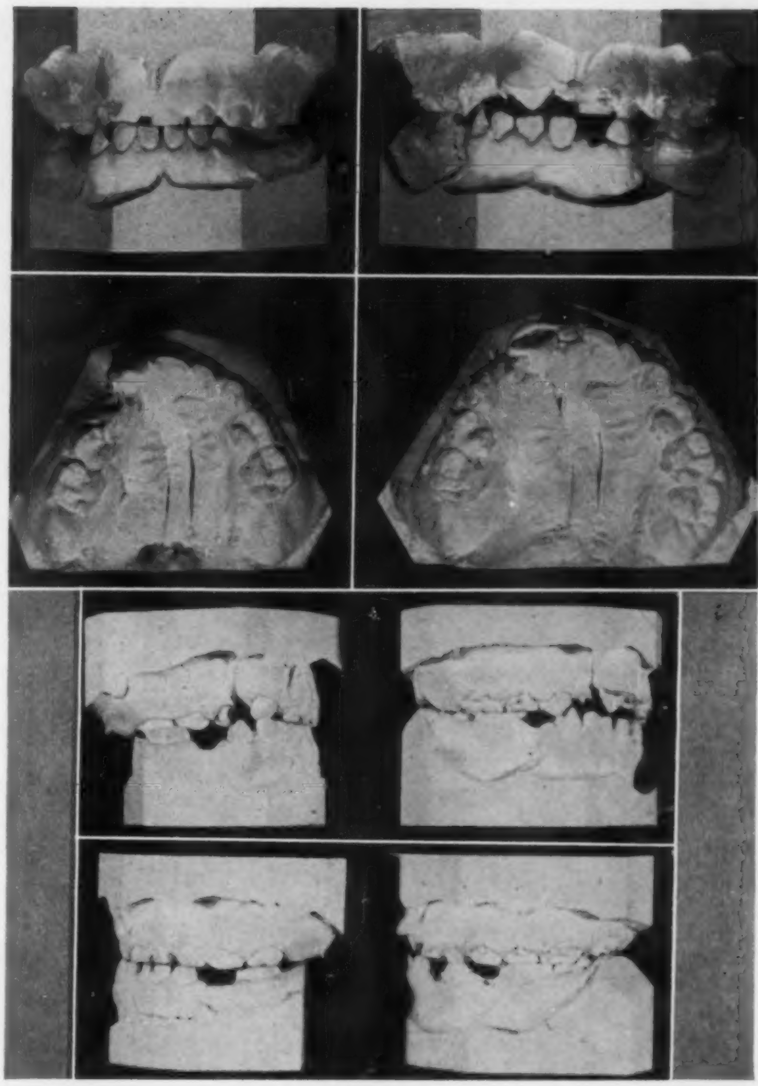

Fig. 13.—Repaired unilateral cleft of the lip and palate on the right side. Note the effects of thumb-sucking.

RATIONALE FOR ORTHODONTIC PROCEDURES

It is well established that in many cases of cleft palate the orthodontist can do more than move teeth within their alveolar processes.[14] The actual movement of maxillary segments by orthodontic devices has been documented by means of frontal laminagraphy for unilateral[8] and bilateral[7] cleft palate. Provided the growth of the palate has not been disturbed by injudicious or untimely surgery, and in the absence of excessive binding cicatricial tissue, any of several expansion appliances will produce fairly rapid correction of cross-bite relations. Such rapid improvements are the results of the movement of the maxillary bones containing the teeth rather than of the teeth themselves.

In our clinic, a variation of the Arnold[15] appliance, recently popularized by Wright,[16] has been favored for the bodily movement of maxillary segments. The two treated cases chosen for illustration represented instances in which this appliance failed of the desired objective when used alone (Figs. 14 and 15). Bodily movement of the lateral segments was impossible until the overlap relation of one segment upon the other was first relieved by the labial expansion of the premaxillary segment. In other words, the orthodontic procedures represented step-by-step reversals of the sequence of events recorded in the infant (Figs. 8, 9, and 11).

A.

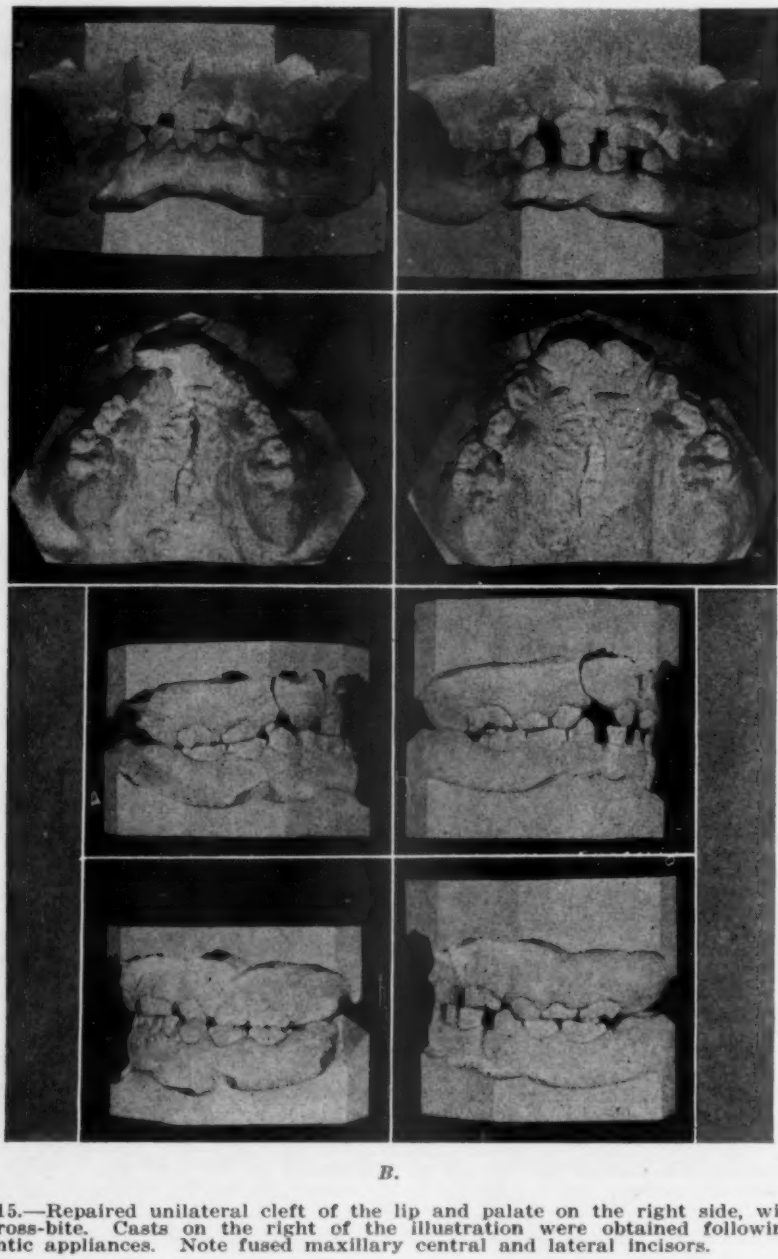


B.

Fig. 14.—Repaired unilateral cleft of the lip and palate on the right side. Casts on the right illustrate changes due to orthodontic treatment during the deciduous dentition.

The sequence of oral orthopedic maneuvers employed in these cases was outlined in the artist's sketch of one of the treated cases (Fig. 16). Step 1 involved the labial rotation of the premaxilla to unlock the smaller palatal

A.



B.

Fig. 15.—Repaired unilateral cleft of the lip and palate on the right side, with atypical bilateral cross-bite. Casts on the right of the illustration were obtained following removal of orthodontic appliances. Note fused maxillary central and lateral incisors.

segment. This can be accomplished by the brief employment of a bite plane cemented upon the lower incisors or by the use of an edgewise arch. The labial arch may be advanced slowly or else an opening loop may be included

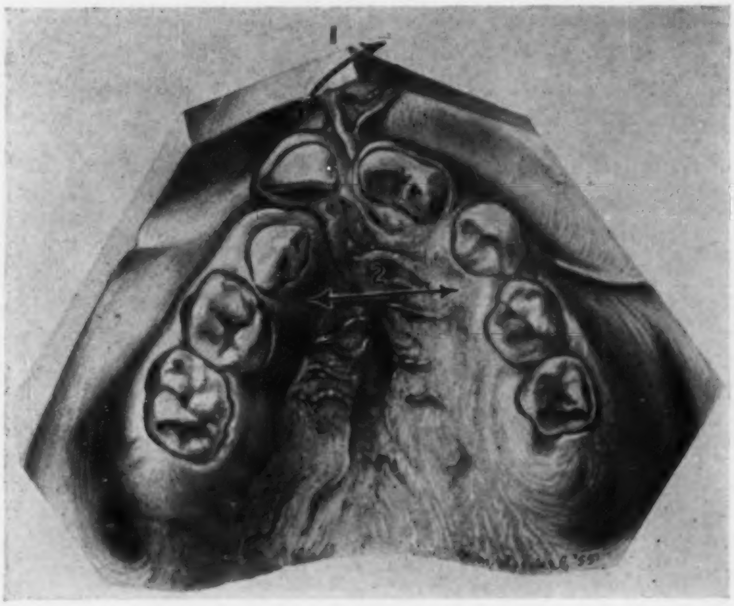



Fig. 16.—Artist's sketch of the untreated maxillary arch in Fig. 15 to demonstrate the sequence of expansions necessary to unlock the smaller segment and allow for its buccal movement.

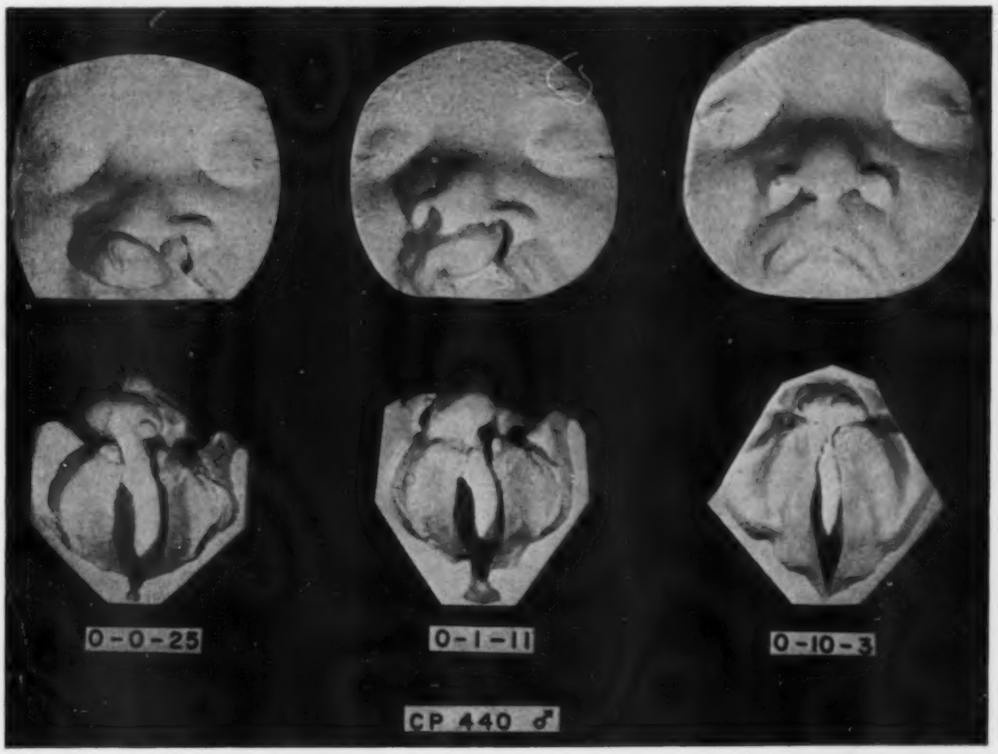



Fig. 17.—Serial casts of the maxillary arch and upper face to illustrate the changes due to the two-stage repair of the lip in a complete bilateral cleft of the lip and palate. Note the effects of muscle tension on the bony segments of the palate.

in the arch at a point opposite the cleft. Once the premaxilla has been rotated forward and lateralward to free the contained segment, the Arnold expander becomes effective and buccal expansion of segments follows.

The Arnold expander is somewhat like a bulldozer in action, for it does the big job of moving segments quickly and corrects most of the cross-bite. But for the final details, such as correcting canine relations, more precise control, as is available with the edgewise appliance, becomes essential.

### THE BILATERAL CLEFT LIP AND PALATE

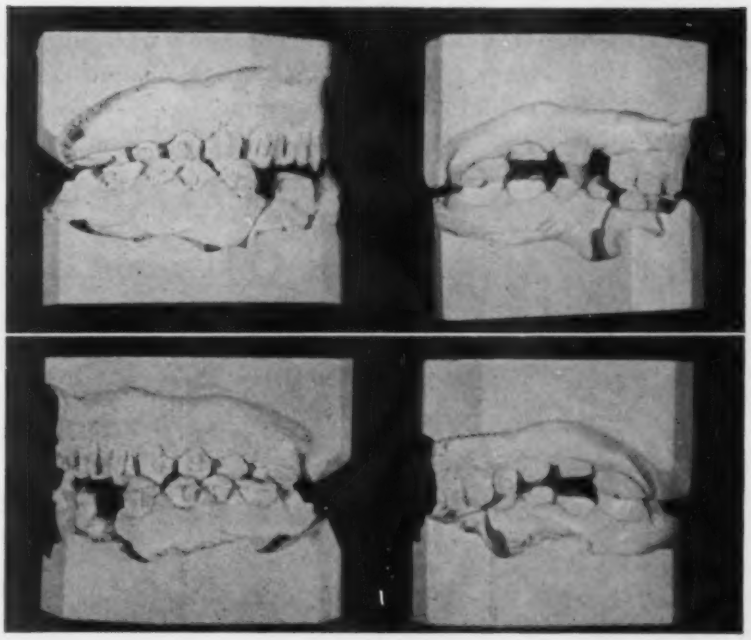
The dynamic effects of lip surgery upon the alignment of the underlying osseous structures is nowhere more strikingly apparent than in the bilateral cleft of the lip and palate and particularly following the two-stage repair of the lip (Fig. 17). After repair of the lip on one side, the asymmetrical muscle pull produces a deflection of midline structures toward the side of repair. Repair of the opposite side establishes symmetry of muscle tension across the midline and this balance of forces realigns the palatal segments toward a semblance of normal arch form. As in the unilateral clefts, the excessive approximation of the palatal processes that may follow lip surgery can be reversed and successfully retained by orthodontic treatment.

The treated case chosen for illustration offered several lessons (Fig. 18). In the first place, failure to treat during the deciduous dentition allowed for the supraeruption of the lower incisors and needlessly complicated the treatment required at this stage. One of the difficult problems encountered with these cases is that of achieving a measure of balance between the upper and lower arches. Maintenance of such balanced relations is directly related to the pattern and potential for growth in the several parts of the face. Had this patient exhibited a tendency toward mandibular prognathism or a deficiency in maxillary growth, or both, the problem of treating this case would have been made more complex. Fortunately, serial cephalometric films revealed a skeletal pattern of growth favorable to the development of balanced occlusion by orthodontic means. Nevertheless, the need for sacrificing dental units in the lower arch in order to achieve a semblance of balance was deemed advisable. Since the mandibular six-year molars were badly decayed, their extraction was recommended in lieu of first premolars.

It is interesting to note that, following the initial phases of rapid maxillary expansion, the patient observed that he could swallow better, for now he had more room for his tongue. The opening that developed in the anterior third of his palate was not a tearing open of the surgical repair. It was the unmasking of an opening previously concealed by the overlapping segments. This opening may be closed by a surgical flap or covered by the prosthesis designed to replace the maxillary incisor teeth.

### CLEFTS OF THE HARD AND SOFT PALATE

Clefts that do not involve the lip or alveolar process but are limited to the hard and soft palates are a group unto themselves, genetically[17] and



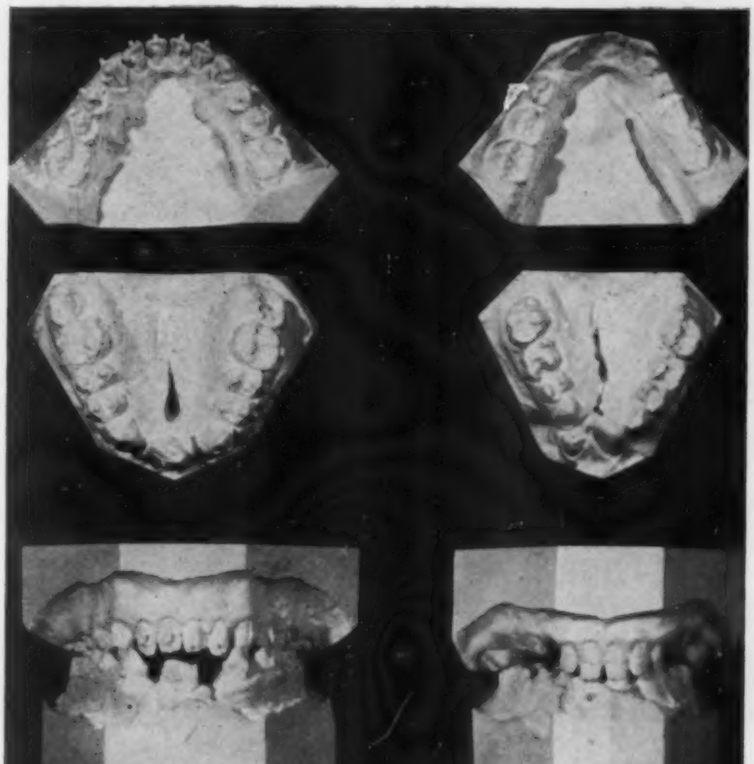


Fig. 18.—Results of orthodontic therapy of a repaired bilateral cleft of the lip and palate. The mandibular six-year molars were extracted in the course of therapy. The unmasking of the opening in the anterior third of the palate by orthodontic expansion is to be anticipated. Such openings are readily closed by further surgery or else obturated by prosthetic appliances.

morphologically. These clefts exhibit a higher incidence of mandibular micrognathia and Class II, Division 1 malocclusions (Figs. 19 and 20) than do the other categories of clefts. In a number of instances, the maxilla was unusually wide so that the buccal segments of the maxilla overlapped the mandibular dental arch (Fig. 21). It would seem that an attempt to contract the dental

Fig. 19.

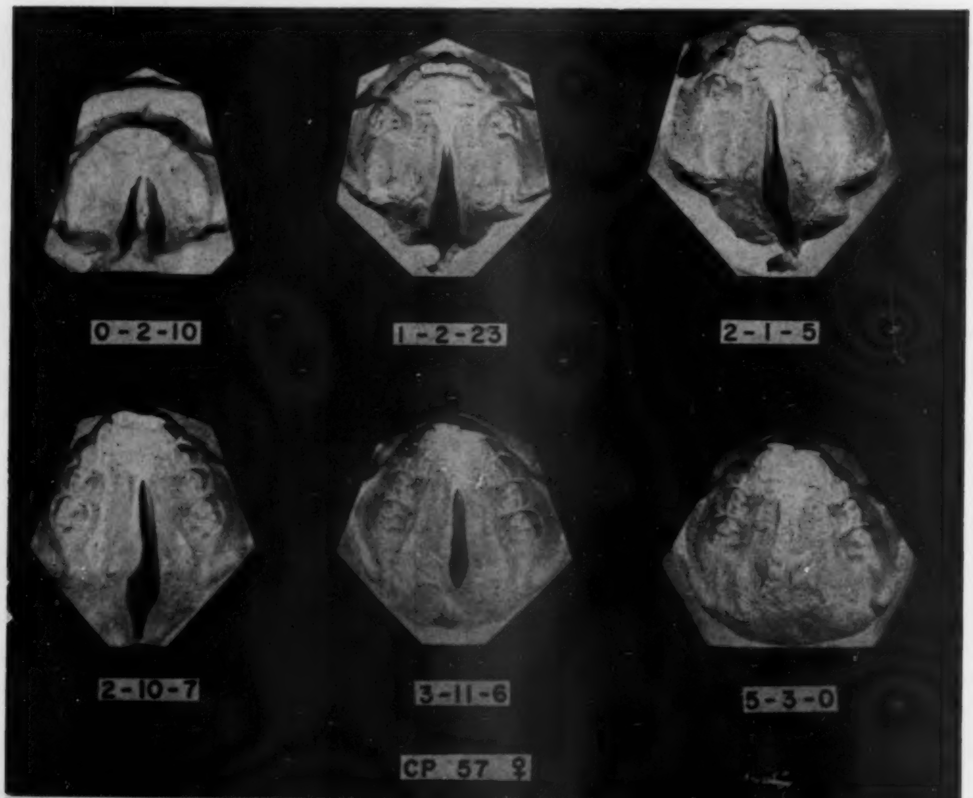




Fig. 20.

Fig. 19.—Serial casts of a cleft of the hard and soft palates. Note the wide cleft in the initial cast and its subsequent narrowing. By 3 years 11 months of age, the soft palate was repaired. The final cast was obtained following repair of the remaining defect in the hard palate. At 1 year 2 months of age, the contour of the alveolar arch was oval in outline. Subsequent casts revealed the gradual development of a tapering arch form related to the labial imbalances characteristic of the Class II, Division 1 malocclusion.

Fig. 20.—Articulated casts of the patient described in Fig. 19.

Fig. 21.—Maxillary casts of four brothers. The first two on the left had unrepaired clefts of the hard and soft palates. The third in line had a repaired cleft of the hard and soft palates. The cast on the extreme right is that of the normal brother. Note the differences in arch form that characterize the unrepaired clefts.

arches by orthodontic measures merits exploration. If medial movement of the palatal segments could be accomplished by orthodontic means, the surgeon's task in repairing the palatal defect would be greatly facilitated.

Some evidence exists to implicate the tongue as a force in displacing the palatal segments and, hence, producing and maintaining a wide cleft and a wide palatal arch. Cephalometric roentgenograms of many of these patients demonstrated that in early postnatal life the tongue was postured within the nasal cavity because of a mandibular micrognathia.[2] As the mandible grew downward and forward from the base of the skull, the posture of the tongue was modified so that its intrusion into the cleft was reduced. Concomitant with these observations, there was a narrowing in the lateral dimensions of the cleft and in the width of the palate across the tuberosities.[2, 7] It may be that, once the plungerlike actions of the tongue are removed from the site of the cleft, the molding actions of the muscles enveloping the maxillary arch become effective in producing an approximation of the palatal segments (Fig. 19). In other cases, where the tongue-in-the-nose posture persisted, the imbalance in the interplay of muscle forces in a growing organism continued and resulted in the arch forms described herein (Fig. 21).

### OBJECTIVES OF EARLY ORTHODONTIC TREATMENT

Paraphrasing Angle's[10] statement on the forces of occlusion, our objectives in urging early orthodontic treatment for children with cleft lip and palate are to provide harmony in the size and relations of the dental arches at the earliest date in a manner conducive to their further growth and development and in relation to the total planned program of habilitation. Recognizing also the interdependence and mutual support of the inclined planes of the teeth and the influences of the muscles of the lips, cheeks, and tongue, our objective is to attain a symmetry of balance between these forces favorable to the growth of the jaws and the eruption of the permanent teeth.

If our compass of thought be limited to the growth of the jaws and the eruption of teeth, then we shall see only a part of the whole problem. The developmental processes of speech and their accompanying intricate neuromuscular synergies are influenced by the anatomic factors of arch form and occlusal relations. It is the relatedness of the speech process to the size, shape, and location of the oral structures that deserves special consideration in timing orthodontic therapy for these children. A narrow, constricted palatal vault and cross-bite produce abnormal tongue posture and prohibit the range and direction of lingual movements essential to articulate speech. The persistence of these unfavorable anatomic relations during the critical years of speech development gives rise to the disturbed postural and kinetic muscle patterns underlying abnormal patterns of speech. For these reasons, orthodontic therapy for the deciduous dentition becomes worth while, even though a second phase of treatment may be required with the eruption of the permanent teeth.

The results of orthodontic neglect during the preschool age period are evident in the serial casts of mirror-image twins with repaired mirror-image unilateral clefts of the lip and palate (Fig. 22). At 3 years 1 month of age, the occlusion on the noncleft side was within normal limits. The characteristic cross-bite relation of the buccal segment on the cleft side was present in this first series of casts.

Three years and three months later, the cross-bite on the cleft side had become accentuated and included the entire anterior segment as well. Concomitant changes in the plane of occlusion of the lower arch were becoming apparent because of the supraeruption of unopposed teeth. Apart from the increased severity in the malocclusion, the examining speech pathologist reported profound disturbances in articulation directly related to the palatal


Fig. 22.—Mirror-image female twins with repaired mirror-imaged unilateral clefts of the lip and palate. The first series of casts was obtained at 3 years 1 month of age. The second set of casts was obtained at the age of 6 years 4 months. Note the increasing severity of the untreated malocclusion.

and dental deformities. Failure to intercept these malocclusions during the preschool period imposed avoidable handicaps which these children had to take with them to school.

From the experience and investigations forming the basis of this report, and from the literature cited herein, the specific goals of early orthodontic treatment for the child with a cleft may be enumerated as follows:

1. Correction of the axial inclination and position of individual teeth within the dental arch.

2. Removal of supernumerary teeth usurping space intended for normal dental units or interfering with the alignment of opposing teeth.

3. Movement of palatal segments in order to re-establish arch form and free these segments for their normal growth and development.

4. Provision of more favorable relations for the eruption of the permanent dentition.

5. Allowance for symmetry of masticatory function.

6. Reduction of susceptibility to dental caries and periodontal disease through improved dental relations.

7. Enlargement of the diameter of the nasal cavities through movement of bony segments, thus leading to improved nasal ventilation.

8. Establishment of optimal conditions for the design and insertion of speech appliances when required.

9. Provision of the symmetry of oral structure and of muscle action conducive to the development of articulate speech.

The realization of these objectives is dependent to a large degree, upon the surgical techniques employed in the repair of the lip and palate. The potential for orthodontic improvement is proportionate to the surgeon's conservatism in manipulating the tissues of the oral cavity.

## SUMMARY AND CONCLUSIONS

The factors determining palatal and denture arch form in various clefts of the lip and palate were described from longitudinal growth records of infants. It was demonstrated that the lateral constriction of the maxillary arch common to patients with cleft lip and palate could not be attributed in all instances to a growth arrest incurred through surgical damage. In the sample of patients selected for this report, the asymmetries in arch form followed simple repair of the lip. The restoration of anatomic and functional continuity to the labial musculature across the unbuttressed bony segments served to approximate these segments toward the midline. In some instances, this medial approximation of palatal segments was excessive, leading to the overriding of one segment upon the other.

Oral orthopedic treatment is dependent in large measure upon the ability to realign the palatal segments by means of orthodontic appliances in much the same manner as reducing a fracture of the maxilla. A selected number of orthodontically treated cases were presented to illustrate the application of knowledge derived from studies on infants to the orthodontic treatment of older children. The sequence of orthodontic expansions necessary to reduce the asymmetries in arch form were based upon a step-by-step reversal of the events occurring in infancy. Although no age limit has been set for the repositioning of the maxillary segments in cleft palate, present experience indicates that such expansions are possible in adults. Where excessive surgical

manipulation produced tight, unyielding labial musculature, binding scars across the palate, and arrests in the growth of the maxilla, such expansions were not possible or, if achieved, were difficult to maintain.

A plea for orthodontic treatment of the preschool child with a cleft was entered on the basis that such therapy provides favorable circumstances for the growth and development of the jaws and for the eruption of the permanent teeth in both arches. Early therapy also serves to reduce the susceptibility to dental caries and periodontal disease by establishing optimal occlusal relations. Good occlusion and normal arch form are essential prerequisites for the development of articulate speech, a process which begins at an early age. Malocclusions and asymmetries of the palatal vault, if allowed to persist during these critical years, lead to compensatory patterns of tongue behavior characteristic of abnormal speech. Other reasons favoring early orthodontic therapy include the establishment of symmetry of masticatory function, improved nasal ventilation as a consequence of increasing the diameter of the nasal chambers, and the facilitation of the design of speech appliances where such devices may be required. In view of the manifold advantages to be gained for the child by early orthodontic therapy, the orthodontist's efforts become worth while, even though a second phase of treatment may be necessary with the eruption of the permanent teeth.

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# VARIATIONS OF LABIOLINGUAL THERAPY IN CLASS II CASES

William L. Wilson, D.M.D., Boston, Mass.

A NUMBER of preconceived notions exist concerning orthodontists and their associated appliance techniques. There are many who believe that orthodontists using multibanded techniques extract too frequently and that their end results show a high incidence of dished-in profiles, closed bites, and reopening spaces. On the other hand, it is believed that labiolingual operators rarely or never extract, overexpand their cases, have a high degree of relapse, and that their patients end up with protrusive profiles. Examples of these are not lacking for proof. However, the criticism should lie not with the appliance, but with the operator. A well-conceived and well-handled appliance will produce only that which the orthodontist chooses.

Satisfactory orthodontic appliance therapy requires both sound diagnostic procedures and realistic treatment objectives. These require special consideration and, due to time limitations, this article on appliance therapy cannot attempt to discuss the diagnosis or objectives involved. Everyone will agree that there is no one appliance that is best suited to all cases, but an orthodontist can be more objective about his objectives if his experience is with an appliance of relatively high universal caliber. Under these conditions, his objectives are not qualified by the limitations of his appliance experience.

The appliance to be described in this article is a variation of the labiolingual which, in its use and concept, bears little resemblance to the labiolingual appliance as it is commonly used and understood. It is a mechanotherapy adapted to a concept of treatment, a concept developed by a group which for years has followed a policy of limited and judicious extractions, at a time when many of today's most ardent extraction exponents were still dogmatically opposed to extractions. This group, too, has continued to expand where indicated. This has been an unpopular stand during recent years, when the dogma prevailed that any or all expansion was undesirable.

Although buffeted somewhat by the ebb and flow of opinion from one extreme to the other, this group has, nonetheless, remained steadfast in its concept of orthodontic objectives. It is easy to be an extremist and follow the party line. A middle road, not bound by the dogma of the extremists, is not always clearly defined and following it requires courage. To do so, one must be continually vigilant to the merits on both his right and his left. He must have a continuing sense of introspection and examination of his studied policy of approach, not to mention an abiding sense of humility before his problem.

Read before the Northeastern Society of Orthodontists, New York, N.Y., March 8, 1955.

The success in this therapy is contingent upon meticulous care and precision in the construction of the appliance. Let us first discuss the labial arch wire, which is used on the maxillary arch (Fig. 1, *A*). The molar bands are constructed of precious metal, .006 inch thick. Seventeen-gauge buccal tubes are soldered onto the buccal surface of the molar band near the gingival border and perpendicular to the long axis of the molar.

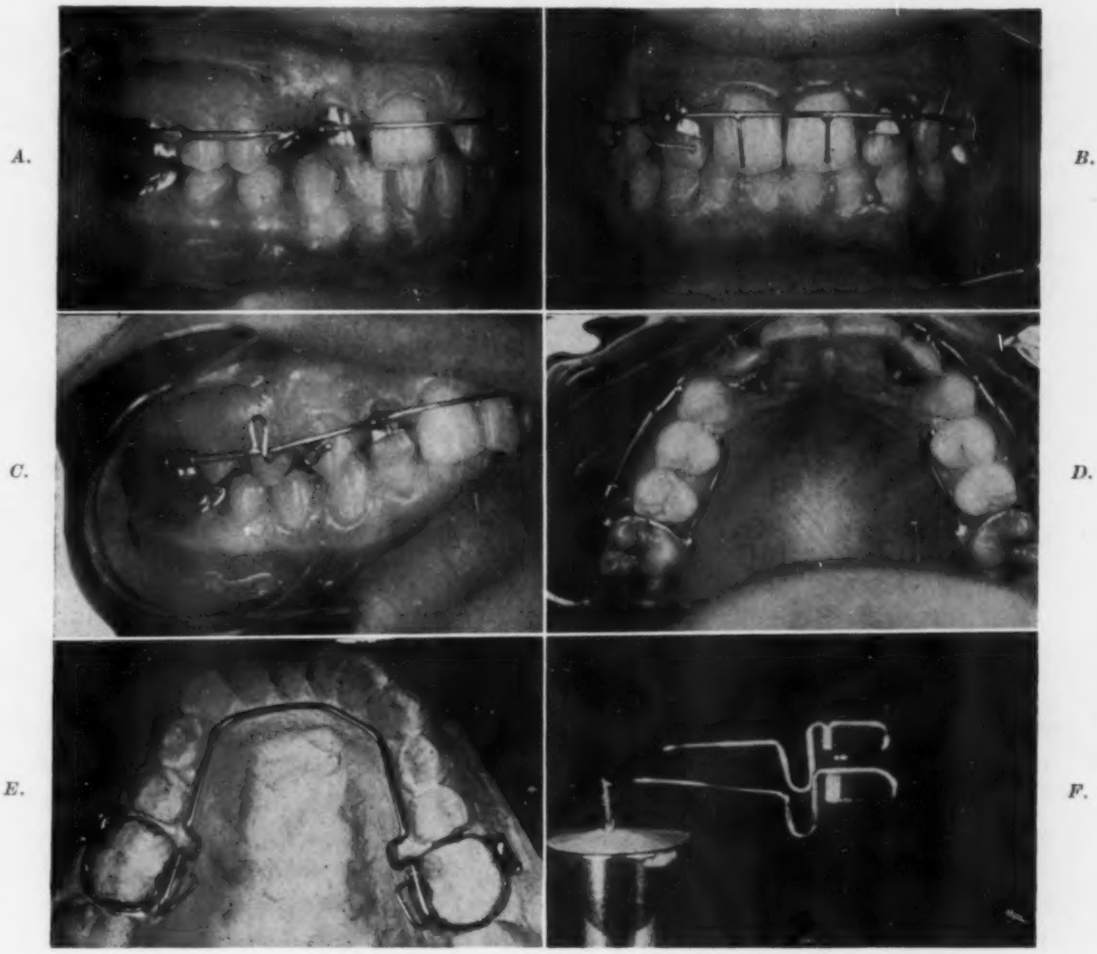



Fig. 1.

The labial arch consists of a threaded 17-gauge end with an adjustable control nut. This section is carried forward to the first premolar, thus rendering stability to the appliance. From there, the arch tapers anteriorly to a 20 or 21 gauge, which allows resiliency and adaptability where needed (Fig. 1, *B*). The maxillary lateral incisors are banded with .004 inch-thick precious metal and Howe locks are soldered to the lateral bands at the gingival middle third. These locks are made by rolling half-round shafting to an .020-inch thickness and are formed to embrace a 19-gauge wire and spliced. This lock permits control of the anterior wire, yet it can be opened and closed to allow freedom or

rigidity as needed. By supplementing this with an additional well-placed spur from the arch wire, the tooth may be moved bodily with the control of an edgewise attachment but with added rotation possibilities. This quality of adaptability is a requirement in treatment. A rigid attachment would fail with this appliance. In certain cases treatment may call for the banding of other teeth instead of or in addition to the lateral incisors. For the great number of cases, however, the two lateral teeth suffice.

Intermaxillary hooks are soldered at the midline of the canines (Fig. 1, *C*). In treatment, multiple and varied finger springs and loops of .020-inch and .022-inch thickness are employed to effect individual tooth movement and rotation.

Palatal arms are then adapted (Fig. 1, *D*). These, made of finished half-round shafting, are soldered to the mesiolingual surface of the molar bands at the gingival border and carried forward, contacting the gingival border of the premolars at their midline and finally being contoured around the mesial of the first premolar. These palatal arms serve the purpose of compounding the posterior anchorage for anterior tooth movement. They can be freed from the first premolar to permit the molar to be moved distally. Where expansion is indicated, a modified directional insertion of the labial arch end and adjustment of the palatal arms can control the direction and degree of change. With the anchorage set up and controlled for the need, teeth may be moved mesially or distally along this arch and rotated into position with ease.

By controlling the nut or by introducing coiled springs, the arch can be developed posteriorly or anteriorly as desired. This is effected by the compounding of anchorage within the arch and the introduction of intermaxillary elastics.

In the treatment of the mandibular arch, the lingual appliance is used almost exclusively, except in Class III cases. There has been much criticism of the lingual arch, both because of its apparent limitations and because of its failure to secure anchorage with intermaxillary traction. This criticism is justified with certain appliance designs. The soldered lingual arches and those with no adjustment loops risk these limitations. On the other hand, the loop-lingual design, to be described, produces an appliance which, with its variations, can produce effectively almost every desired movement and, furthermore, it is well adapted for intermaxillary traction.

The mandibular first molars are banded with material .006 inch thick (Fig. 1, *E*). Intermaxillary hooks are soldered on the mesiobuccal corner of the band. Half-round tubes are soldered on the lingual surface of the band, parallel to the long axis of the molar on the midline of the mesiolingual cusp. The precision fitting, half-round post is soldered at right angles to the 20-gauge arch wire which turns 90 degrees down at the mesial of the first molar and loops up again to engage the midline of the second premolar (Fig. 1, *F*). The wire is adapted to contact the midline of each tooth around the arch at its most gingival point. This continues around to the other molar.

On the anterior teeth, the arch must engage the incisors at the cingulum, even if there must be a slight amount of gingival impingement. As indicated in Fig. 2, this produces more bodily movement and allows for compounding of anterior resistances for moving of posterior teeth distally. When the arch rides high on the anterior teeth, there is an undesirable resolution of forces as indicated. Auxiliary loops and fingers of .020-inch thickness can be used for expansion or contraction, and also for moving teeth mesially or distally along the arch. The lingual loop, then, is a necessary reservoir into which and from which wire length can be fed or obtained as the requirements of the arch length indicate.

It is readily possible to secure mandibular anchorage with the loop-lingual arch during Class II elastic traction. This requires a studied approach to each case. Attention to detail in arch construction is imperative. The half-round tube and post must have precision qualities and the directional anterior component must approximate a 90 degree relationship with the molar anchorage.

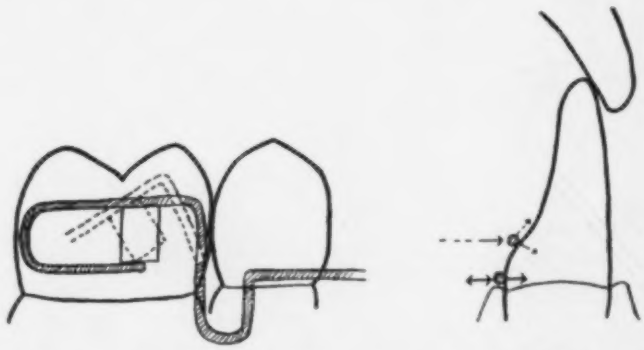


Fig. 2.—This diagram shows graphically the resolution on anterior forces with the loop-lingual appliance. The posterior segment shows the necessary wire parallelism of the molar and more anterior section as well as the half-round post-to-tube parallelism. The dotted sections show a common error in adjustment. Strict conformity to these principles of adjustment is a necessary key to successful use of the loop-lingual appliance.

For each and any adjustment in the arch, compensating adjustments, sometimes as many as three or four, are required to retain neutral relationships in the balance of the arch. These must be understood and strictly adhered to or control is lost.

The securing of anchorage is contingent upon the summation of contact resistances in the buccal segment and the anterior placement of the arch in contact with each tooth in the position indicated in the diagram. Incomplete adherence to this detail will result in proportionate loss of anchorage.

In cases where there is a labial axial inclination of the mandibular teeth prior to treatment, it is advisable that these be retracted and verticalized before the loop-lingual arch wire is secured for Class II traction.

Success or failure depends on (1) delicate appliance adjustments within the arch in order not to override the selected anchorage and (2) adequate case analysis in terms of sequence and critical timing of the arch adjustments and

A. B.

C. D.

E. F.

G. H.

I. J.

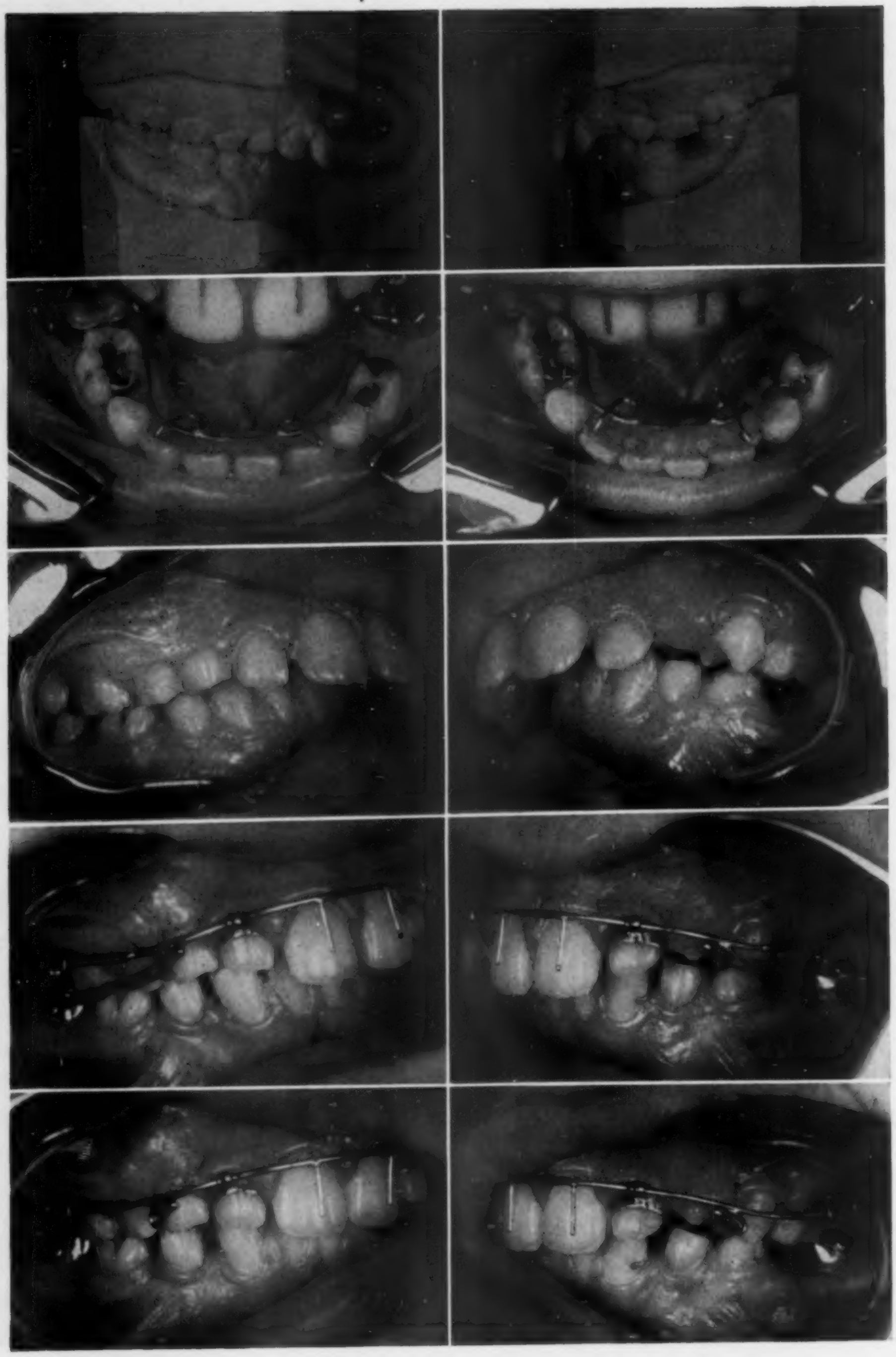


Fig. 3.

Class II traction. This mechanotherapy, properly conceived and carried out, is well suited to almost all cases. Deficiencies in appliance adjustment will require that a supplementary tissue-borne or occipital anchorage be used.

This loop-lingual is a dynamic three-dimensional appliance, effective and efficient. However, mastering the fine and delicate adjustments requires time-consuming study and practice in handling. Otherwise, abuse of the appliance

A. B. C. D. E. F. G. H.

Fig. 4.

results in discouraging case failures. These are failures of the operator, not of the appliance. In the illustrations that follow, attention will be focused entirely upon appliance use in Class II therapy.

Figs. 3 and 4 show the progressive treatment stages of a Class II, Division 1 case. This case is complicated by a lower arch collapse resulting from the

premature loss of a deciduous tooth on each side. As in each of the cases to be shown, a maxillary labial arch and a mandibular loop-lingual arch were placed. On the lingual arch, finger loops of .020-inch thickness were utilized to bring the lower four anterior teeth together, following which they were verticalized and the arch was secured. Fingers .020 inch thick were soldered on the labial arch to engage the maxillary incisors for retraction. Then intermaxillary elastics were placed, the anterior teeth were retracted into position, and the relationship was corrected. The illustrations show the progressive steps on the right, left, and median. Arch length and shape have now been determined and the case is held to await complete eruption of the premolar teeth. Rotation ligatures will correct the anterior teeth and then the case will be freed from the maxillary arch and a Hawley retainer with a bite plane will be used to effect final bite changes.

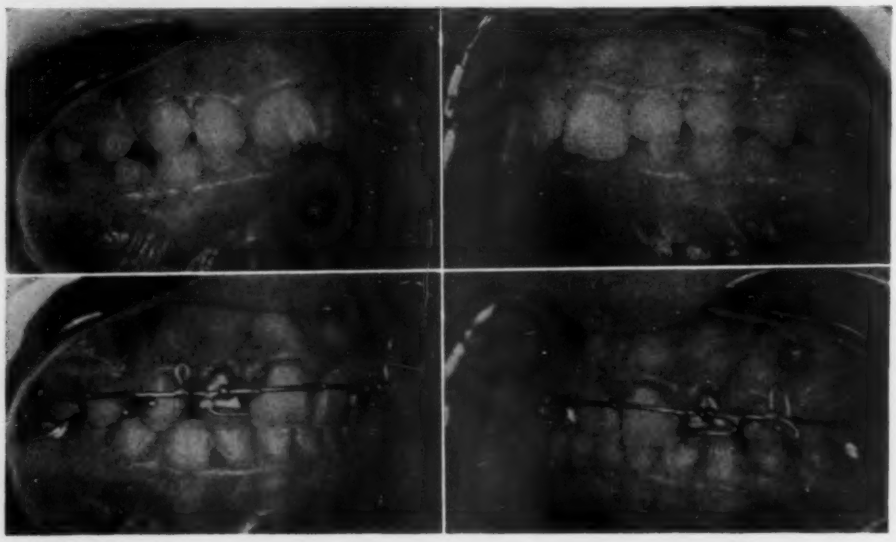


Fig. 5.

Fig. 5 shows appliance changes in a progress report over a nine-month period. In this instance the lower arch is expanded and the anterior teeth are verticalized and then stabilized and prepared for Class II traction. A slight expansion of the maxillary arch is effected by the palatal arms. The anterior teeth are then retracted and rotated by contacting the arch against critical points on the incisors. It is interesting to note that in this instance no rotation ligatures have yet been placed. Anterior rotations, for the most part, are ignored unless a situation might tend to interfere with the case development. As spaces are provided for the teeth, gentle and critical bearing of the appliance against the teeth, in addition to occlusal force, will cause many rotations to take place spontaneously. The application of rotating ligatures is reserved until the final stage of treatment.

Fig. 6 shows a Class II case in which slight maxillary expansion preceded Class II elastics. Anterior reciprocal arch adjustments aligned the incisors.

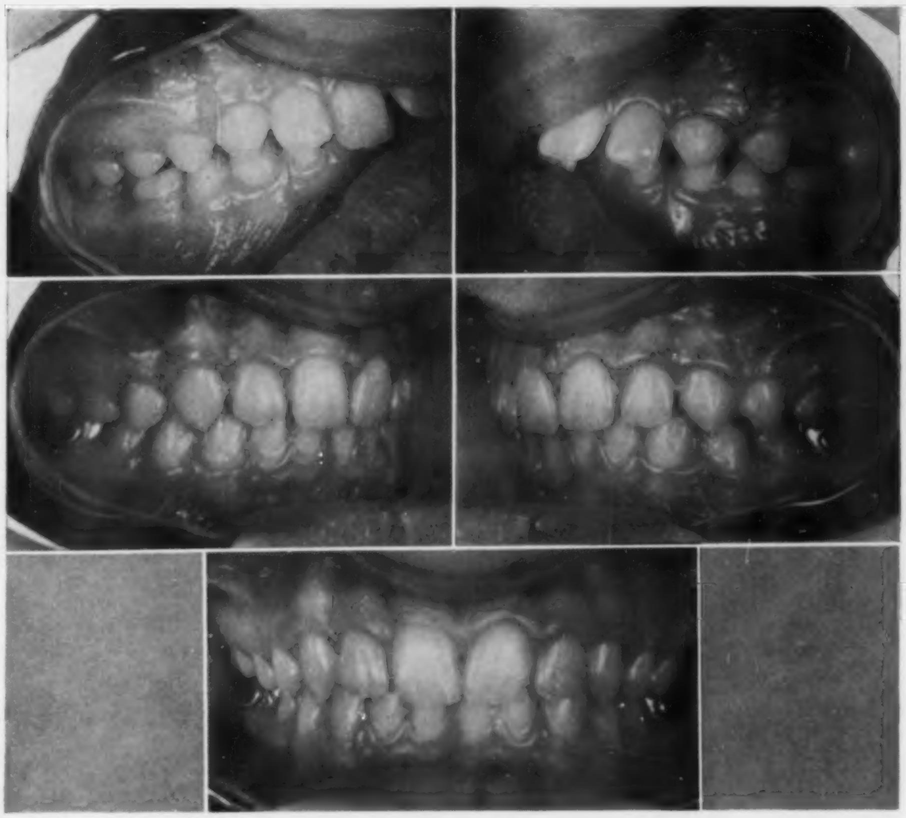


Fig. 6.

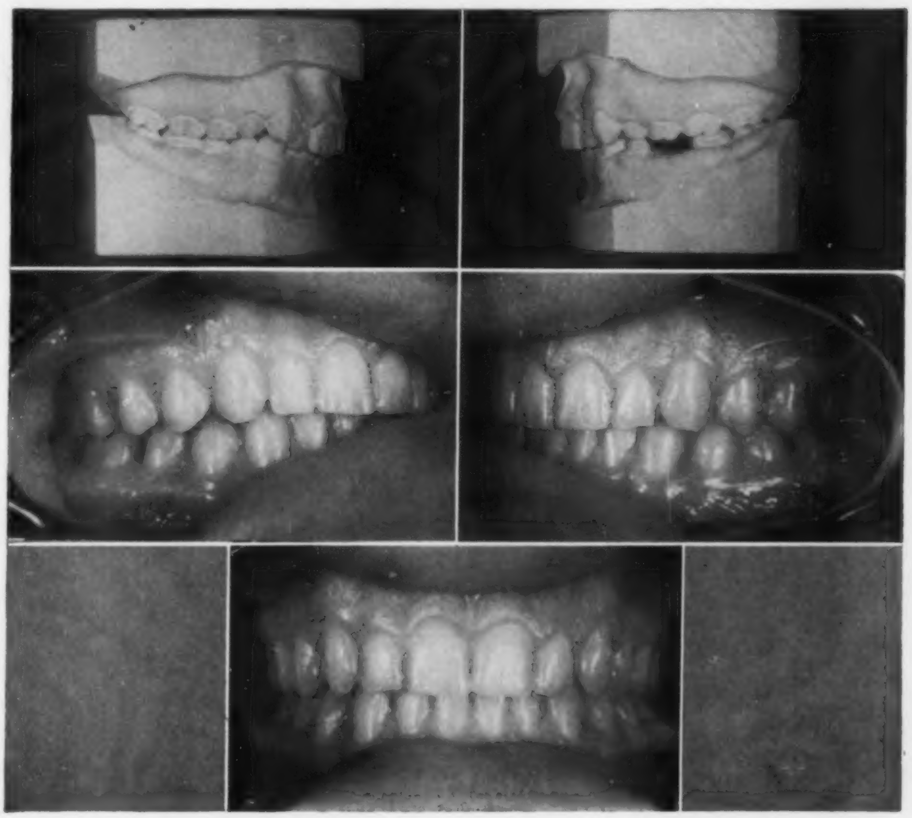


Fig. 7.

This was followed by .020-inch auxiliary fingers for final rotations. Eighteen months of therapy preceded a Hawley retainer with bite plane.

Fig. 7 shows models of a Class II case treated for a period of fifteen months. The photographs were taken three years after treatment.

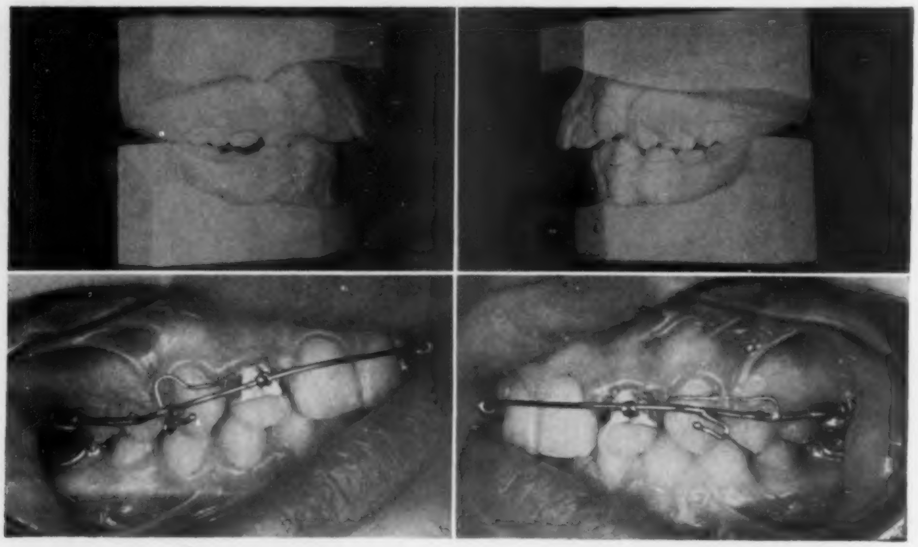


Fig. 8.

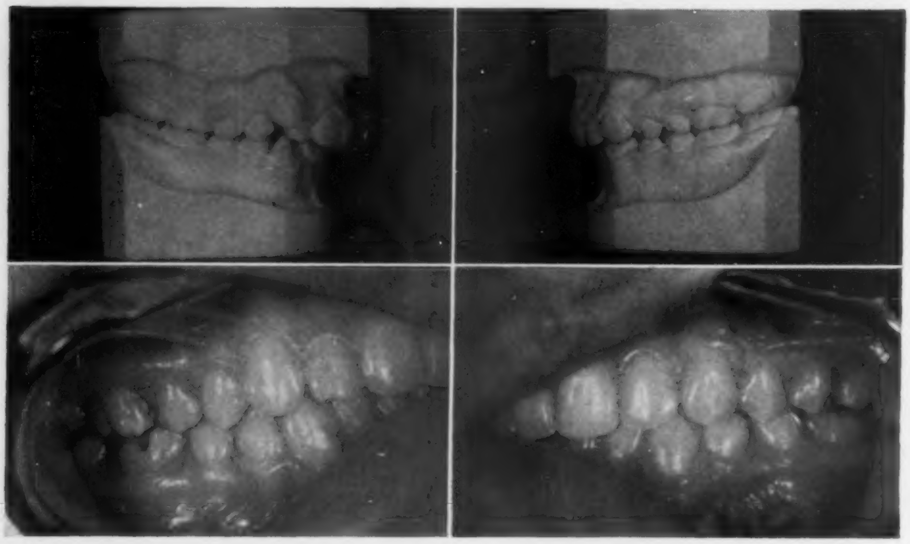


Fig. 9.

Fig. 8 shows a Class II, Division 1 case in which there is an anterior protraction of the maxillary six anterior teeth. Here the lower arch was prepared and Class II therapy corrected the relationship, following which loops

were applied to retract the maxillary canines into position. This was followed by a bearing of the maxillary arch on the four anterior teeth to retract them into position. This result was effected in fifteen months' time.

Fig. 9 shows a Class II case with a mesial drift of both the maxillary and mandibular right segments. The lower lingual arch was prepared and the molar was moved distally, then the second and first premolars were carried distally with .020-inch finger loops, permitting space for the canine to be brought into line. At this point, the lower arch was secured and Class II elastics were applied with coiled springs against the maxillary first molar, to carry the molar into Class I relationship. This was followed by the use of .020-inch loops to retract the second and first premolars, allowing the canine to be brought into line. The case was then followed up with regulation Class II therapy to correct both arches. This case was completed in eighteen months. The photographs show the case three years following treatment.

Fig. 10.

Fig. 10 shows a Class II case with the maxillary second molars in buccal occlusion. Extensions .025 inch thick were soldered from the labial arch distally over the buccal tubes to engage the second molars, moving them lingually.

When this cross-bite was corrected, slight expansion was given to the upper arch and Class II elastics were applied. The follow-up photographs show the case three years after treatment.

Fig. 11 shows a Class II, Division 1 case with third molars in position. The lower left second premolar has been displaced lingually. Appliances were placed and the lower arch was developed to make room for the second premolar to be brought into line. Then the maxillary first premolars were extracted. The palatal arms were secured around the mesial of the second premolars for retention and the maxillary canines were banded with Howe locks and intermaxillary hooks on the distal-buccal-incisal corner of the bands. Intermaxillary elastics

Fig. 11.

then were engaged from the lower lingual arch wire to the canine bands, retracting the canine teeth along the arch wire in a trolley effect. This trolley was adjusted to carry the canines into position. Once in position, the canine bands were removed and extensions were soldered onto the palatal arms to engage the mesial of the canines to hold them securely in position. The labial arch was then free for intermaxillary traction to retract the four anterior teeth. This case was completed in fourteen months.

In the next series of illustrations we are going to utilize a different principle, the coiled spring principle for moving maxillary segments distally. In each of these cases, the lower lingual arch wire is secured and intermaxillary traction is applied to the maxillary arch. The nuts on the maxillary arch are moved away from the buccal tube and a coiled spring is inserted. The success of this treatment requires a delicate activation of this coiled spring which is exactly neutralized by the wearing of a No. 15 intermaxillary elastic, thus causing the balance of the labial arch to be neutral. The sole force then is applied through the coiled spring against the molar.

Fig. 12, *A* and *B* shows the application of this coiled spring principle. The labial arch is bent or tipped up distally so that the molar is carried backward and upward to avoid occlusal resistance of the curve of Spee. More frequently than not, the transverse periodontal fibers cause the second premolars to follow. However, it is almost always necessary to add an .020-inch finger loop to retract the first premolar. This, in turn, is followed by retraction of the canine. Fig. 12, *C* shows the maxillary right teeth having been retracted into position in a period of six months' time.

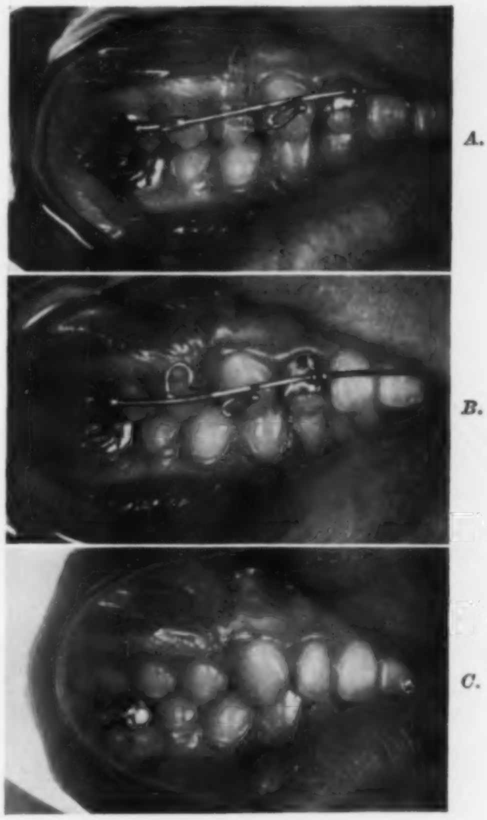



Fig. 12.

Fig. 13 shows a step-by-step appliance therapy in a Class II case using this coiled spring principle. This case was completed in eleven and one-half months' time. Fig. 13, *A* shows the problem on the right side, with extrusion of the maxillary central incisors and closed bite. Here the lower arch was prepared once more and lower teeth were verticalized and then the lingual arch was secured for intermaxillary traction. Coiled springs were applied and the molars and second premolars were carried distally as shown in Fig. 13, *C*.

In Fig. 13, *E* a loop has been added to retract the maxillary right first premolar into position. The palatal arms are now readjusted around the first premolars to secure them in position. Fig. 13, *G* shows that an .020-inch loop has now been added to retract the canine. The adjustment of this loop is delicate

so as to be completely neutralized by the intermaxillary elastic, thus avoiding any undesirable labial arch pressures. The labial arch, coincident with this treatment, has been adjusted to bring gentle bearing on the maxillary four anterior teeth for their realignment.

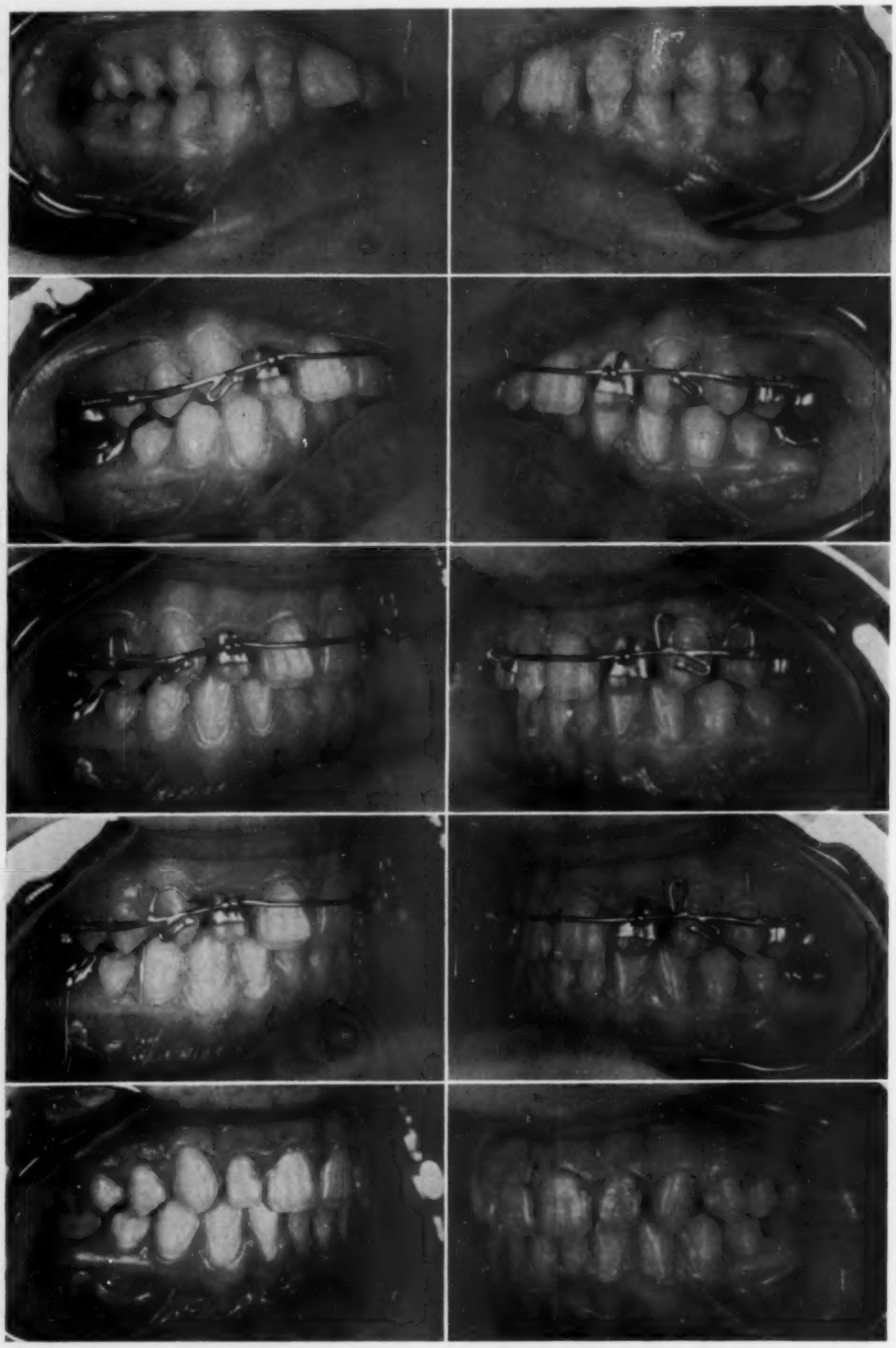



Fig. 13.

Fig. 13, *B* shows the problem on the patient's left side. Here, the maxillary second premolar is rotated. This is banded with rotation hooks. Ligatures complete the rotation of this premolar into position. Coiled springs are applied much the same as on the right side and the molar and second premolar are retracted into position, with the first premolar following along as in Fig. 13, *D*. With the addition of a loop, Fig. 13, *F* shows the first premolar in position and the retraction of the left canine with the loop. Fig. 13, *H* shows it in position at the time of the following visit. This maxillary left canine is 1.5 mm. narrower than its mate. The resulting space is closed slightly by ligating around the intermaxillary hook to the mesial of the Howe lock on the lateral band to slide

A. B. C. D. E. F.

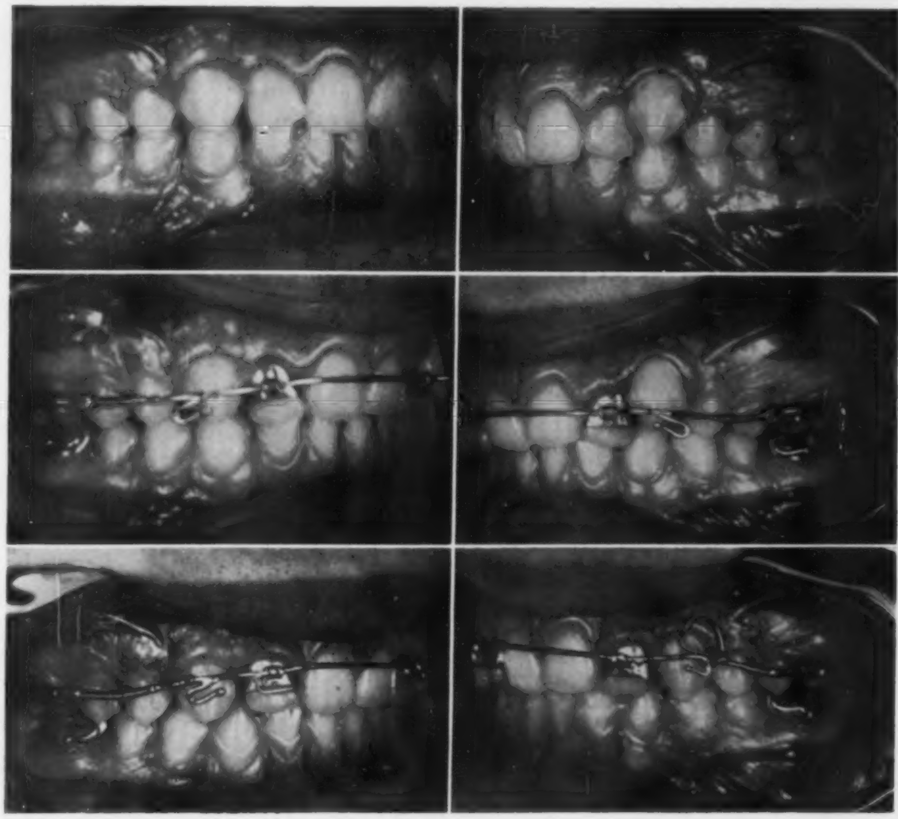


Fig. 14.

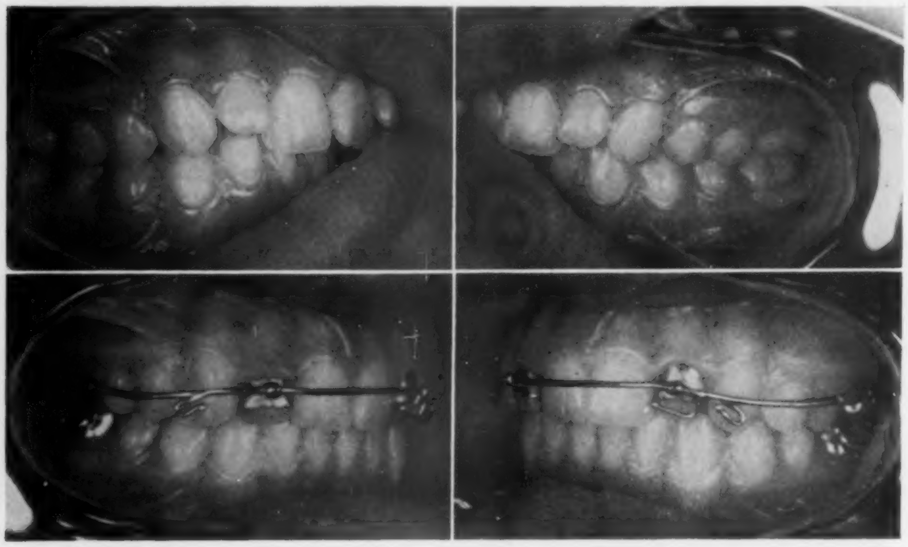
the lateral incisor along the trolley more nearly into position. This lateral incisor is now secured by an .020-inch stop on the arch wire and the central incisors are rotated into position with ligatures at the last two visits. Fig. 13, *I* shows the right side in Class I relationship with the small lateral incisor, and Fig. 13, *J* shows the left side in position with a small canine.

The next case involves a Class II, Division 2 malocclusion. Fig. 14, *A* shows the right side prior to treatment. Fig. 14, *C* shows the right side progressing, having been treated with coiled springs and activated loops to retract the teeth into position. Fig. 14, *E* shows the right side corrected, with a maxillary

right lateral incisor now being rotated by an .020-inch finger L. Fig. 14, *B* shows the Class II condition on the left side prior to treatment. Fig. 14, *D* shows the case after coiled springs have been applied and the premolars retracted distally. Fig. 14, *F* shows the space for the canine now provided and the canine being brought into position. It might be noted here that the first molar has been slightly overtreated, which is desirable in these cases. Once the appliances are removed, this settles nicely into position. These illustrations reflect twelve months of active treatment.

A.

B.



C.

D.

Fig. 15.

Fig. 15, *B* shows a Class I condition on the left side of a patient with much anterior crowding which has resulted from a mesial drift of the maxillary right posterior segment, as shown in Fig. 15, *A*. This has resulted in crowding of the anterior teeth. Here, the treatment has been the same. First the molar, then the premolars, and finally the canines have been retracted into position, through the coiled spring and finger loop principle. The anterior teeth now being freed of the posterior pressure with gentle bearing of the arch wire at critical points against the anterior teeth have effected this result without any rotating ligatures whatsoever. At this point, the case is ready for final rotating ligatures, which will require two visits. Fig. 15, *C* shows that the left side has remained undisturbed during this treatment.

Fig. 16 shows a Class II, Division 2 case. Here the labial arch was used with coiled springs to verticalize the maxillary central incisors. This was done by adapting the palatal arms around the mesial of the first premolars to supplement the posterior anchorage. Then the shape of the labial arch was changed from a flat to an upward curve on the incisors and the coiled springs were activated against the maxillary incisors. Once the maxillary arch was prepared,

it was secured and intermaxillary traction then corrected the relationship. After appliances were placed, this patient was treated in nine visits over a period of nine months' time.

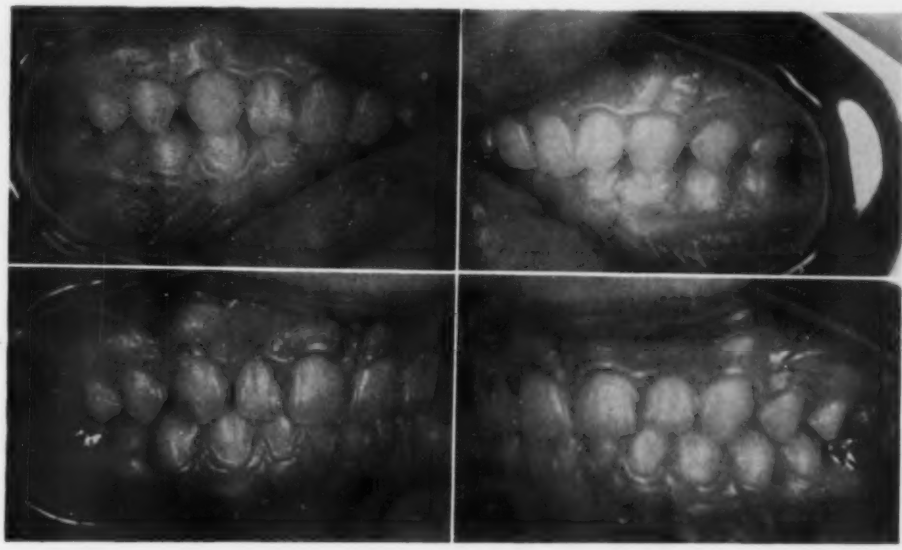


Fig. 16.

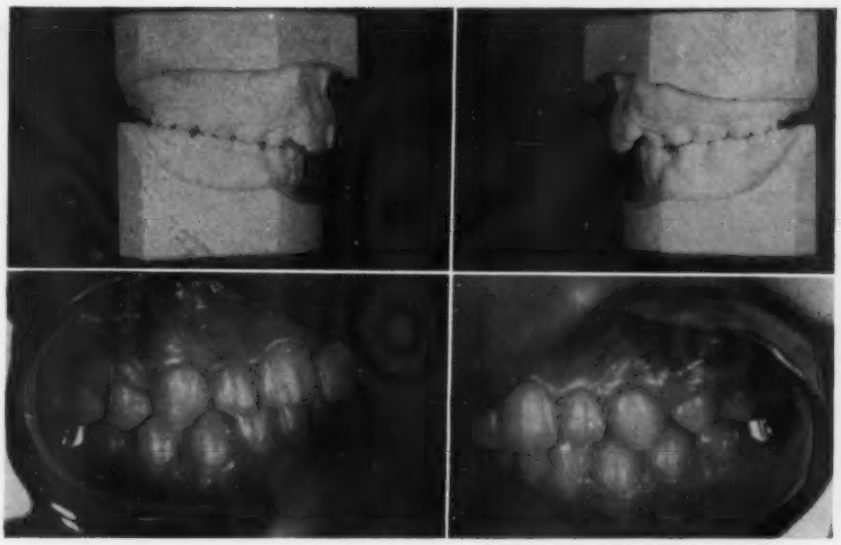


Fig. 17.

Fig. 17 shows the treatment results of a Class II case with a severe collapse of the lower arch resulting from a missing lower right deciduous canine. The lower lingual arch wire was placed and the lower arch was developed and stabilized before intermaxillary traction was applied. Then the coiled springs were activated to carry the maxillary teeth distally into position and the anterior teeth were rotated. Treatment time was twenty months.

Fig. 18 shows a Class II, Division 2 case. The intraoral photographs show the case three years after treatment.

Fig. 19 shows another Class II, Division 2 case; the intraoral photographs show the patient three years after treatment.

The final case (Fig. 20, *A*, *B*, and *C*) shows an involved Class I malocclusion with the maxillary median line displaced to the right. This has resulted from a drifting distally. Fig. 20, *A* shows the lateral incisor in contact with the first premolar, the posterior teeth having drifted mesially somewhat. The lower first premolar is in buccal occlusion, there having been a mesial drift also of the mandibular buccal segments. Beginning with Fig. 20, *D*, the lower arch has been developed and the lower first molar has been moved distally to provide space for the first premolar to come into line. Then the lower arch is secured and the Class II coiled spring principle is once more applied, carrying the maxillary right molar and second premolar and, finally, the first premolar distally into position. During this time, reciprocal pressure permitted us to ligate the lateral incisor to a loop on the arch wire to bring the lateral incisor around to help improve the median line.

Fig. 20, *E* shows the midline correcting and the bite-opening taking place. Rotations up to this point have been purely by the bearing of the labial arch wire against the teeth. Fig. 20, *F* shows the space prepared for the erupting canine. A stop at this point is soldered onto the arch wire distal to the lateral incisor to prevent the lateral incisor from sliding back. Fig. 20, *G* shows that the action of the coiled springs has carried the left molar and premolars distally to allow room for the canine to erupt into position. Fig. 20, *H* shows the maxillary left first premolar now in position, with the lateral incisor and canine being carried distally by the use of shrinking ligatures from distal to the intermaxillary hook to mesial of the Howe lock on the lateral incisor. Fig. 20, *I* shows an auxiliary .020-inch loop to improve the midline, following which the lateral incisor was ligated, using the trolley effect to bring the anterior teeth into position. Fig. 20, *J*, *K*, and *L* shows the appliance off. A Hawley retainer now controls the teeth and causes the canines to erupt lingually into position.

In order to present this amount of material pertinent to Class II therapy, it has been necessary to delete many illustrations from the case histories. I have shown only those pertaining to the point of discussion. Well handled, this appliance, more nearly than any other, is a universal appliance. With its variations, the labio-loop-lingual appliance is equally well suited to Classes I, II, and III and extraction cases. It is not only suited to the permanent, but also to the early and transitional, dentitions. Where indicated, arch expansion or contraction is readily possible. Individual teeth can be moved buccally or lingually, mesially or distally, as needed. Rotations are effectively achieved and relationship changes are readily effected.

By now it is obvious that this concept of labiolingual therapy is a far cry from the early expansion arch and differs widely from the application of the other lingual arches, in both its use and its control. It has no resemblance what-

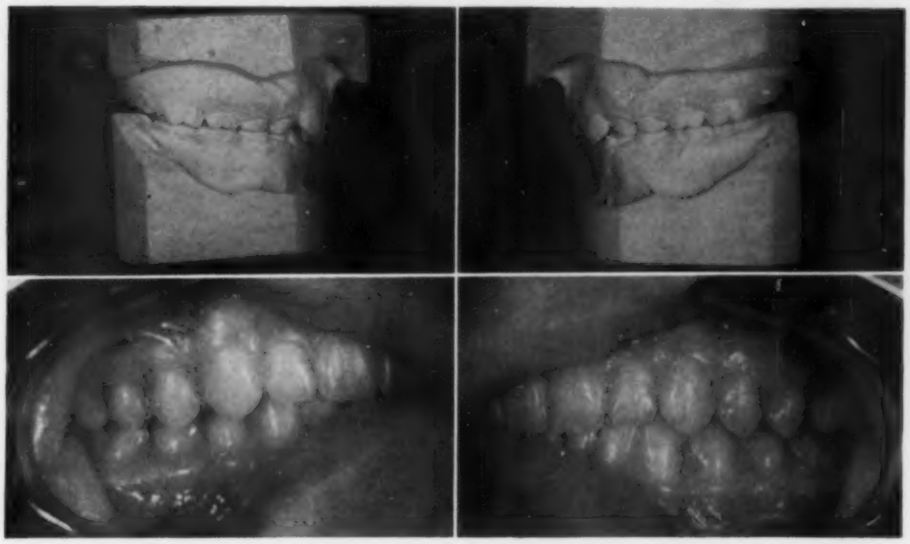


Fig. 18.

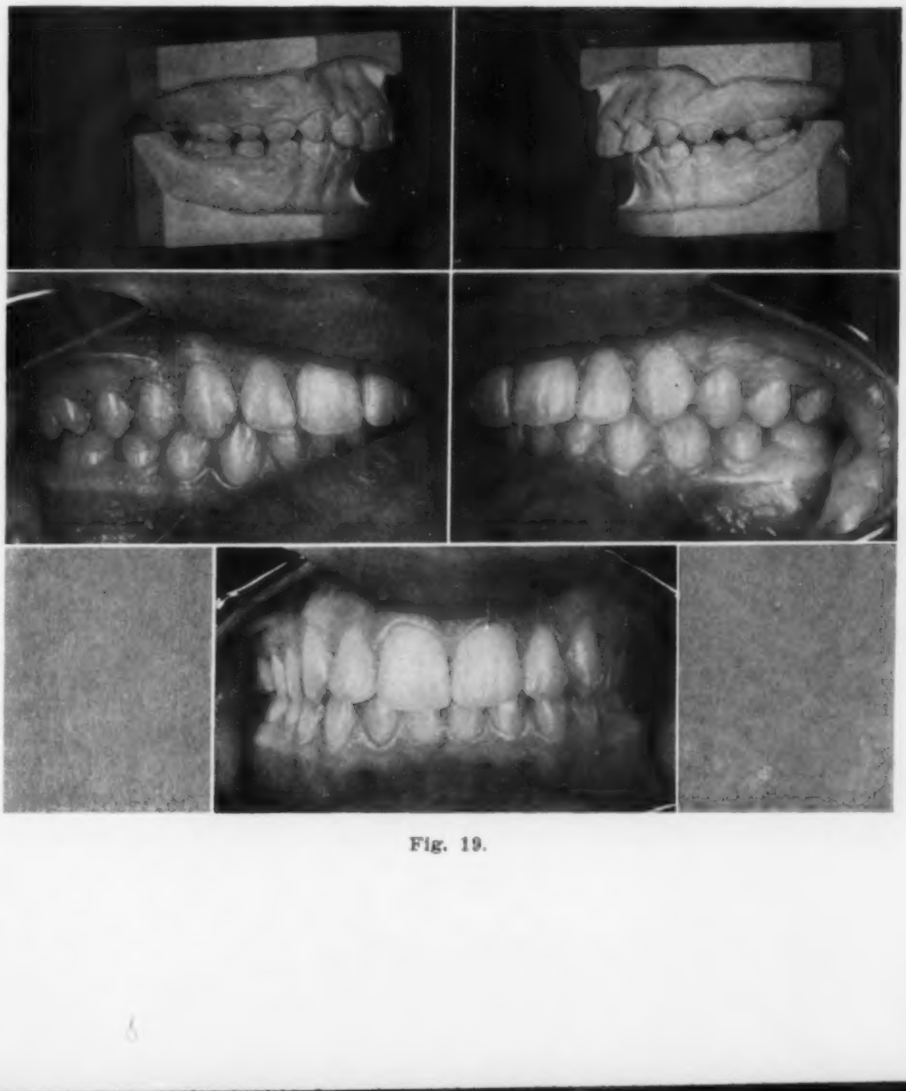


Fig. 19.

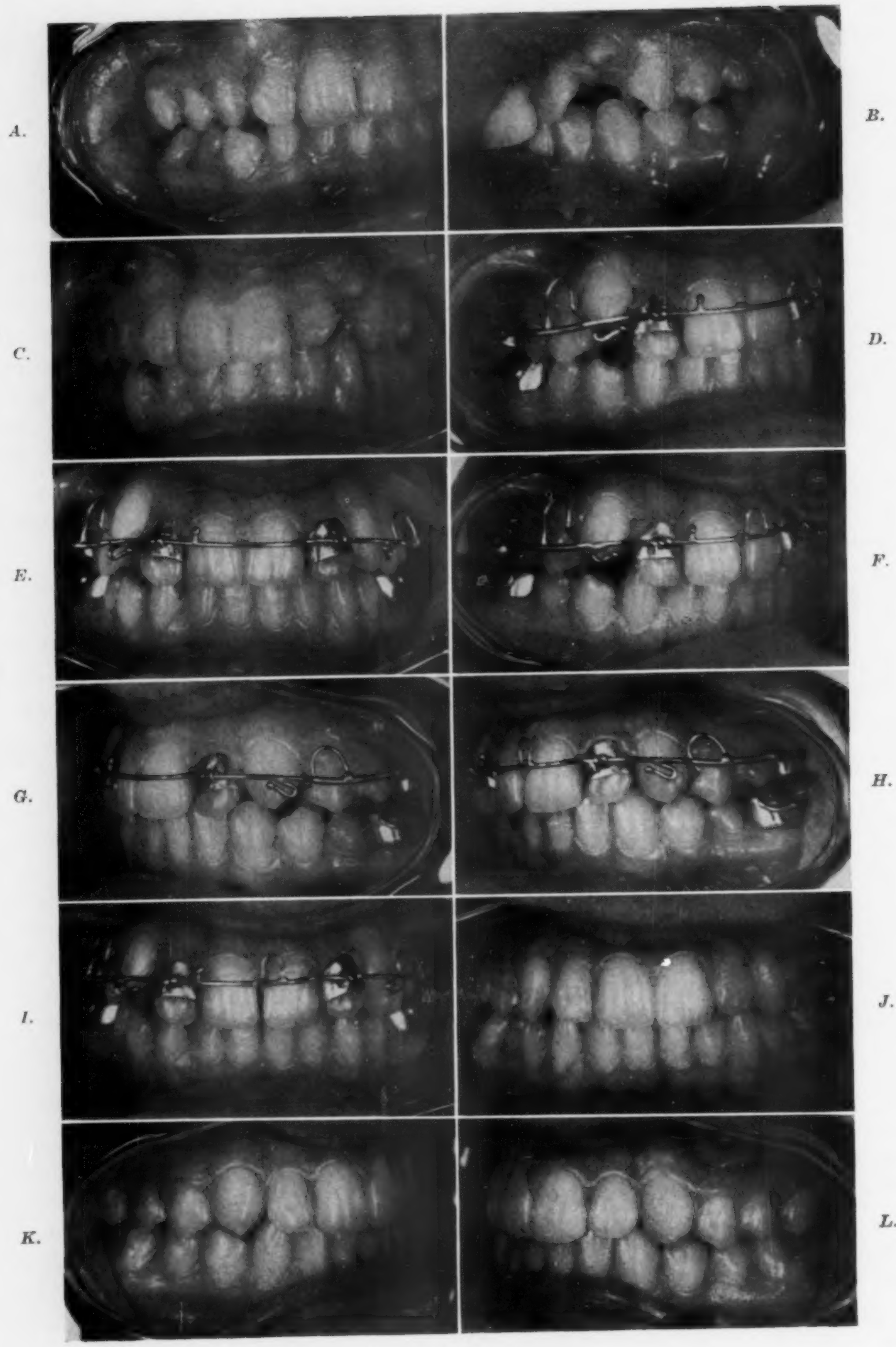



Fig. 20.

soever to the guide plane technique. This is a distinctly new approach and yet it is not new, as it embraces many of the desirable advantages of some of the previously mentioned techniques and it circumvents the hazards of each.

This therapy, like edgewise, utilizes the principle of preparation and control of mandibular anchorage, before and during Class II therapy. It borrows but reverses the twin-arch coiled spring principle, thus avoiding the canine pile-up. With its multiple and varied finger spring applications for effective individual tooth movement and rotation, it requires delicate adjustments like those of the Crozat appliance.

This is a fixed appliance, simple in design, positive and direct in action, delicate yet resistant to easy breakage, quickly removed and inserted, and allowing the maximum of hygiene.

There are no appliance failures with this or any other appliance. Many failures result from faulty diagnosis or ill-conceived objectives. In some cases, failure results from improper handling of the appliance of choice. The simple appearance of these appliances belies their true nature. Inexperienced and injudicious handling can quickly ruin a case.

In this mechanotherapy, where so few teeth are banded, the problems of anchorage are far different from those of a multibanded technique. It becomes both important and necessary to use all the subtle resistance factors which may serve as a basis of anchorage. The fulcrum on which a tooth moves is contingent upon the relationship of the point of pressure application to the inherent resistance. It is necessary, then, to understand the critical points and the critical timing with which delicate forces are to be applied. In every case the minimum force necessary should be used to effect a movement. This force at all times must be sufficiently minimal to be absorbed and supported by the selected resistance or anchorage.

If we are to achieve the structural balance, the functional efficiency, and the esthetic harmony we all desire, our appliance therapy must be fundamentally in accord with the biologic principles of growth and heredity.

This being the first presentation of this concept of mechanotherapy, I would like to mention the fundamental work of the late Drs. Lawrence W. Baker, Horace Howe, and William E. Speers. Special mention is due Drs. C. Paul Bonin, Paul Newhall, and Everett A. Tisdale, without whose more recent basic contributions the development of this concept would not have been possible.

As for the labio-loop-lingual appliance, I commend this to you for your consideration and study.

230 Beacon St.

# VARIATION OF TOOTH SIZE IN THE ETIOLOGY OF MALOCCLUSION

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THERE are two chief ways in which tooth size variation may be associated with malocclusion of the teeth:

1. Tooth size in one jaw may not be in harmony with the tooth size in the other jaw.
2. Crowding may be more likely to appear in jaws having large teeth than in those with small teeth where, instead, there may be a tendency to overspacing.

A variation in the relationship between upper and lower teeth has been observed by several authors. Deviations from the average relationship can be local or general. Local deviation can be observed especially for the upper lateral and central incisors and for the lower second premolars.

I used cases taken at random from some elementary schools in order to demonstrate in what way and to what extent the variability between the upper and lower teeth influenced their position and occlusion.

The relationship between the breadths of upper and lower teeth was examined by means of three indices:

$$\text{Index 1: } \frac{I_1 + I_2 + C \text{ (lower jaw)}}{I_1 + I_2 + C \text{ (upper jaw)}} \times 100.$$

$$\text{Index 2: } \frac{P_1 + P_2 + M_1 \text{ (upper jaw)}}{P_1 + P_2 + M_1 \text{ (lower jaw)}} \times 100.$$

$$\text{Index S: } \frac{I_1 + I_2 + C + P_1 + P_2 + M_1 \text{ (lower jaw)}}{I_1 + I_2 + C + P_1 + P_2 + M_1 \text{ (upper jaw)}} \times 100.$$

Altogether, 195 boys and 124 girls, mostly between 12 and 15 years of age, were studied. For all these children the incisors and canines were measured to the nearest 0.1 mm., directly in the mouth. For 140 boys and 87 girls hydrocolloid impressions were taken, and undamaged tooth breadths of the premolars and first molars were measured on the casts. The casts were used also for a study of the tooth position and occlusion.

The histogram in Fig. 1 demonstrates the variability of the three indices. Fig. 2 shows that the range of variation is great enough to influence the tooth

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position or occlusion, showing the average, maximum, and minimum widths of the upper teeth with the average tooth size in the lower jaw (the limits of the variation calculated as $\pm$ 3 $\times$ standard deviation of the various indices).

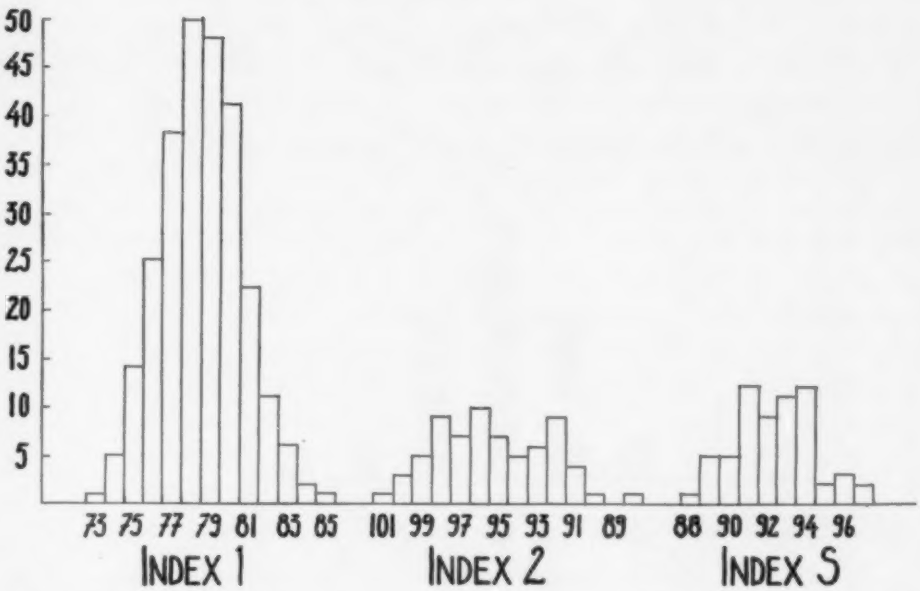


Fig. 1.—Distribution of indices 1, 2, and S showing variability of the investigated tooth breadth ratios between upper and lower teeth.

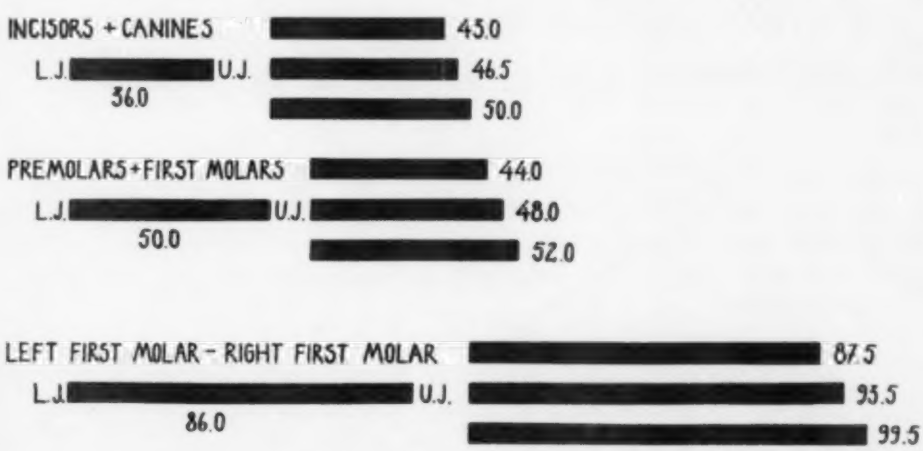


Fig. 2.—Combination of average ($=\bar{x}$), maximum, and minimum tooth breadths in the upper jaw (*U.J.*) with average tooth breadths in the lower jaw (*L.J.*). Errors of measurement have been eliminated. Maximum and minimum values have been calculated as $\bar{x} \pm 3 \times$ standard deviation.

It seems obvious that a 6 mm. addition to or subtraction from the tooth breadths of the upper $M_1$ to $M_1$ in a case of ideal occlusion must result in some observable derangement in either tooth position or occlusion.

The effect of the variation in the tooth breadth ratio on the dentition has been studied through the correlation of this variable and the following charac-

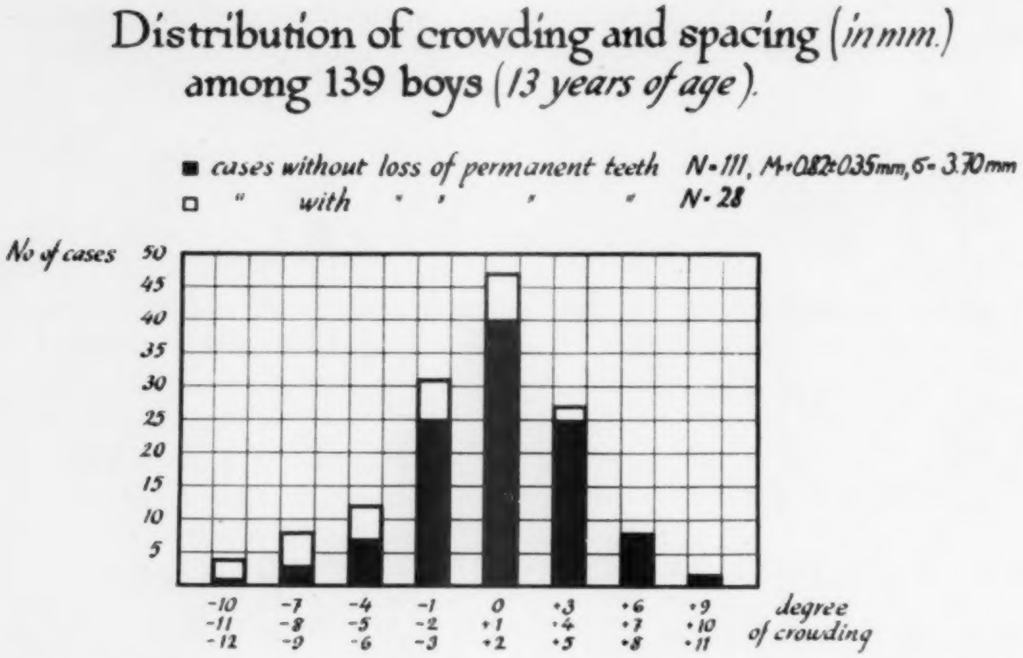


Fig. 3.—Distribution of crowded and spaced upper arches in 139 boys about 13 years of age.

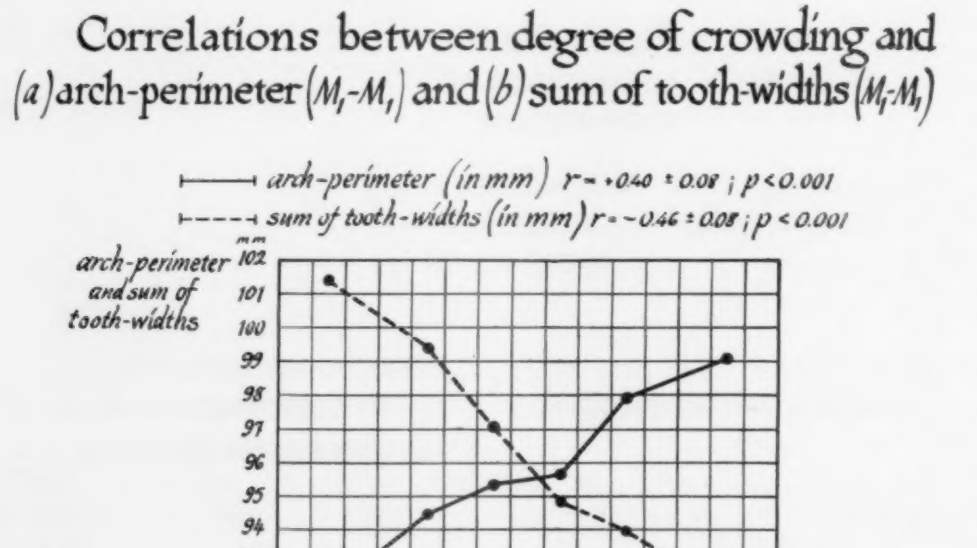


Fig. 4.—Correlations between the degree of crowding and (a) arch perimeter and (b) size of teeth in 139 boys about 13 years of age.

teristics of the tooth position and the occlusion: (a) difference in crowding between upper and lower jaws (measured from $P_1$ to $P_1$); (b) overjet (measured at the central incisors); (c) overbite (measured at the central incisors); and (d) molar occlusion (measured in a mesiodistal direction at $M_1$).

The only demonstrable association was between the tooth breadth ratio and the difference in crowding between the jaws (coefficient of correlation = 0.41 ± 0.11). Arches with comparatively large upper teeth thus showed a tendency to more pronounced crowding (or less spacing) in the upper than in the lower jaw, while cases with comparatively small upper teeth displayed the opposite difference. An adjustment of the overbite or overjet does not seem to be the method used by Nature for accommodation of disharmonies in the tooth width ratio between the upper and lower jaws.

The absolute size of the teeth may influence the tooth position, even if there is a harmony between the upper and lower teeth. Investigations by Lewis and Lehman[2] and Lysell,[7] of the deciduous dentition, and by Lundström[3-5] Seipel,[11] and Moorrees and Reed,[8] of the permanent dentition, have shown that there is a connection between the sum of the tooth breadths and the degree of crowding or spacing. Persons with large teeth are more likely to have crowded teeth than those with small teeth. In Fig. 3 the distribution of crowded and spaced upper arches is illustrated according to the findings for the 140 boys mentioned. The association between this variation and the tooth breadths is shown in Fig. 4. The correlation coefficient is –0.46 ± 0.08, indicating a fairly strong connection. The most probable explanation of this seems to lie in the genetic mechanism. A distribution of the type indicated would be obtained if some hereditary factors affecting the dimensions of the jaw were to some extent inherited independently of other hereditary factors that determine the dimensions of the teeth.

The therapeutic conclusion of these investigations seems to be that extractions can be justified from a biologic point of view in such cases of severe crowding where the crowding can be suspected to be a result of lack of harmony between the hereditary factors relating to the teeth and jaws.

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# Editorial

## The Dentist in Public Health Affairs*

DENTISTS are needed for leadership roles in public health affairs. The more interest taken by members of the dental profession in public health endeavors, the more interest will be shown in dental health activities by individuals other than dentists. Certainly, every dentist should consider it an honor as well as a privilege to serve as a member of a state board of health at either the state or local level. It is an obligation as well as a real opportunity to be of service to the public as well as the profession. Boards of health have been established to formulate rules, regulations, and policies of the health department. The dentist on a board of health needs to be an energetic opportunist and a good thinker, and must have an interest in all phases of health activity. Such a spokesman for the dental profession places dentistry on a higher plane in the community as well as in the minds of citizens, and the community gains as he takes his responsibility seriously.

Other ways that a dentist may serve in public health affairs are by serving as a public health dentist, as a member of an advisory board, on health councils, as a cooperative dentist providing dental care for indigent children, and on other types of community dental health projects.

The dentist should always be aware of the best ways that better dental health can be attained in the community. The energetic promotion of water fluoridation in a way best suited to gain its adoption should be a major responsibility and duty of every dentist.

It is of vital importance that each state health department in this country have a well-trained dental staff, and that the dental leaders serve as advisors and/or as cooperative dentists so that the best type of dental and public health programs obtainable are assured.

*O. A. O.*

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*During the period subsequent to World War II, a number of dentists served as members of various state health departments in America. In checking on this activity, it was learned that a number of orthodontists are included who have devoted a great deal of time to this type of public service. One of these is the editor of the journal representing the Southern Society of Orthodontists, Dr. Oren A. Oliver. Accordingly, Dr. Oliver was asked to write his views in regard to this subject. Orthodontists no doubt will be proud to learn of the civic responsibilities assumed by many members of their profession and the above editorial calls attention to certain civic responsibilities not often referred to in the text of the AMERICAN JOURNAL OF ORTHODONTICS, but plainly engaged in by a number of orthodontists.

# Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

**Open Wider, Please. The Story of Dentistry in Oklahoma**: By J. Stanley Clark. Norman, Oklahoma, University of Oklahoma Press, 1955. 31 illustrations and 24 appendices.

Oklahoma has been famed in song and story, and now in a history of its dentistry. Recently published by the Oklahoma Press and written by J. Stanley Clark, historian, another volume of highly interesting dental facts can now be added to the literature. This attractive volume, consisting of some 400 pages, traces in narrative form the development of dentistry in the state.

Beginning with Chapter I, "New Frontiers," the author prefaces the beginning of his account with a succinct review of the early settlement of the Indian Territory and the role played by early dentists in the disappearance of America's last frontier. Through the succeeding ten chapters, the author cleverly inserts bits of local history that tend to add interest rather than to detract from the central theme of dentists, dentistry, and dental organizations. To the 299 pages of the account have been added some 83 pages of appendices, consisting largely of names and the Code of Ethics.

Many problems face an author of a local dental history or, for that matter, any author of a history of an occupation or profession. One such problem is the presentation of historical facts, particularly when confined to a restricted area, in such a manner of style and with sufficient embellishments of a general nature as to maintain a narrative of considerably wide appeal. This problem the author has solved quite successfully, with the possible exception of a certain burdensome amount of names and small details which, to the reader not familiar with the area, might prove somewhat boresome. At the same time, these details proved exceedingly interesting to one such as your reviewer who, having been born in pre-statehood days in the Oklahoma Territory, had the four maxillary primary incisors extracted by Dr. G. A. Nichols. It is recalled that Dr. Nichols at that time maintained a part-time practice in the little town of Cashion, located some twenty-five miles northwest of Oklahoma City in Kingfisher County. Dr. Nichols, who is referred to on page 47 as a good horse and mule trader, was quite noted in the area, too, for his prowess with the forceps. Considering the lack of ready cash by the early settlers of that time and place, Dr. Nichols no doubt found that horse and mule trading was the better part of dental practice.

From the many personal interviews the author has been able to secure from pioneer dentists, a word picture has developed which portrays not only the development of technical procedures during three-quarters of a century, but presents many facets of a social and cultural development of a Western

pioneer population. In those days, and in that great area which the Government had set aside for the home of many Indian tribes, existence on the part of both the pioneer dentists and the early settlers was precarious, to say the least. Requirements demanded ruggedness of character and strict determination to overcome the many handicaps inherent to the time and place. Gangs of outlaws (typified by the Dalton and Jennings gangs), floods, tornadoes, drought, money panics, poor transportation, and other handicaps of a lesser nature provided the background for the emergence of dentistry as an organized profession along with the advancement of the Territory to a rich and progressive state.

The volume also points up the early determination on the part of those few pioneer ethical dentists to regulate the practice of their profession. At the first session of the Territorial Legislature (1890), which, incidentally, still holds the record for the many laws enacted, two practicing dentists were selected to draw up "an act to regulate the practice of dentistry in Oklahoma Territory." The many laws enacted at this session would, under ordinary circumstances, preclude consideration of dental affairs, and only by the determination of those dentists was the act adopted. As the author states, "Weak as this act proved to be, it was nevertheless an important milestone in the history of Oklahoma dentistry. Pharmacy and dentistry were the only professions for which laws regulating practicing and licensing were passed. . . . This is more remarkable when it is recalled that not until after statehood, in 1908, did a law appear on the statute books for the regulation and licensing of physicians."

All in all, your reviewer unqualifiedly recommends this volume to those interested in the historical development of our profession, and commends it as a stimulant to other state associations, who have not already published their history, to go and do likewise.

*Berton E. Anderson.*

**Plicae Palatinae Transversae and Papilla Incisiva in Man. A Morphologic and Genetic Study.** By Lennart Lysell, Department of Orthodontics, the Royal School of Dentistry and the Department of Anatomy, the Caroline Institute, Stockholm. 137 pages, illustrated. Acta Odontologica Scandinavica, Vol. 13, Supp. 18, Stockholm, Sweden, 1955.

Although the palatal rugae were recognized in earlier works on anatomy, they were first described by J. B. Winslow in 1732. Reference to the rugae in dental texts is comparatively scant. The author's attention was originally drawn to the rugae as a possible guide in determining paternity. In this work, which was written as a doctorate thesis, we are provided with a detailed study of the palatine rugae. It includes an historical review and a system of classification and description. Sources of error in impression taking, drawing the pattern, measurement, and estimation of individual rugae are discussed.

While the posterior limit of the rugae zone in most cases presents bilateral symmetry, the rugae themselves are not bilaterally symmetrical. In general, the backward inclination of individual rugae is more marked in females than in males. The posterior limit of the rugae is, on an average, at the distal of the second premolar.

Numerically, the rugae remain largely unchanged up to the age of 23 years, after which they appear to decrease. The rugae zone in the youngest group extended, on an average, to the mesial of the second deciduous molar. The posterior rugae limit tends to move distally up to 20 years and is found at the mesial of the first permanent molars in the older groups. As age increases there is a tendency for the backward direction of the rugae to decrease. At the

same time, there is a forward displacement of the teeth in relation to the rugae. Björk found a decrease of about 3 degrees in the angle between the plane of occlusion and a line joining the anterior and posterior nasal spines. The teeth appear and actually move forward in relation to the rugae during growth.

Certain changes occur in the rugae pattern during the greater part of life; they are so small that the original pattern is still recognizable. This, Lysell believes, can be valuable in identification of persons, provided that a detailed system of rugae recording is used.

Evidence is presented to indicate hereditary influence on the length and width of the incisive papilla, but there was no valid evidence of any hereditary influence on the variation in the number of rugae or on their characteristics. Comparison of twins suggests general but indefinite similarities in the rugae pattern which possibly could serve as a guide in distinguishing identical from fraternal twins.

Attempts to establish paternity by means of the rugae pattern indicate that it is not a reliable method, although it may be of some assistance in a general anthropologic study of paternity determination. It is concluded by the author that the rugae do not even approach the fingerprint method in reliability as a basis for identification of individuals, nor can the rugae be used in establishing paternity.

This is a valuable contribution to a subject which has been largely neglected in dental literature.

*J. A. S.*

## Abstracts Presented Before the Research Section of the American Association of Orthodontists, San Francisco, May 11, 1955

**A Roentgenographic Study of the Temporomandibular Joint Using a Special Head Positioner**: By William L. Lawther, D.D.S., Walter Reed Army Hospital, Washington, D. C.

This study was conducted in an effort to learn more about the normal articulation of the temporomandibular joint. Standardized roentgenograms were made of the temporomandibular joints on three groups of persons. The first group was comprised of eleven white men between the ages of 20 and 30 years, each of whom had a good complement of natural teeth (twenty-six or more) in a Class I articulation (Angle classification). The second group of eleven white men ranged between 30 and 40 years of age and also possessed a good complement of natural teeth in Class I articulation. A comparison of the results of these two groups was made to see if there was any significant difference between the two groups in the temporomandibular joint articulation. The third group was made up of edentulous persons who had been wearing full upper and lower dentures for over three years. In addition to the three groups of normal persons, eighteen patients who complained of temporomandibular joint disturbances were radiographed. These patients were evaluated and compared with the normals or standards. Several of these patients were followed serially, with records being made before, during, and after treatment.

All the radiographs of the temporomandibular joints of the normal persons and the radiographs of patients with temporomandibular joint disturbances were made with the person's head positioned in a special head positioner that was designed and built for temporomandibular joint roentgenography. The head positioner places each patient's head in exactly the same relationship to the x-ray tube and the x-ray film. It holds the head in position by

means of ear rods inserted in each ear and a nasion rest attachment which can be held firmly against the bridge of the nose.

The target-film distance is 68½ inches which, for all practical purposes, eliminates enlargement and distortion in the roentgenograms of the parts being radiographed. This makes possible the use of orbitale, porion, the superior surface of the sphenoid bone, and the posterior border of the ramus as reference and orientation points.

A tracing was made of each temporomandibular joint roentgenogram. Four linear measurements and two angulations were read and recorded from each tracing.

**A Radiographic Evaluation of the Temporomandibular Joint in Edentulous Subjects (Read by Title):** By Sheldon W. Rosenstein, D.D.S., Northwestern University Dental School, Chicago, Ill.

This study was undertaken to learn further about the temporomandibular joint while it functions without the help of the teeth. The data obtained in this study were compared with those derived from the Donovan study in 1953 on 100 normal persons, and significant similarities and deviations were noted. The collection of data and their utilization followed two general lines of approach: a direct clinical observation and examination of the subject and a cephalometric radiographic examination. In the clinical examination, the subjects were examined both objectively and subjectively, and the temporomandibular joint was palpated and observed in functional movement. In the radiographic examination, the subjects were positioned in the Broadbent-Bolton cephalometer for lateral exposures, and use was made of the modified Donovan temporomandibular joint orienting device for the temporomandibular joint radiographs. In order to facilitate the study of all functional movements of the mandible on one master tracing, a template tracing was used for each series of exposures. In the group of thirty-one subjects, nineteen (61 per cent) exhibited temporomandibular joint symptoms either before or after the edentulous period. The temporomandibular joint radiographs compared favorably with the Donovan measurements in the respect that there appeared to be no significant differences between the two groups placing the condyle in the fossa in the retrusive position in regard to both height and depth. Since a definite mean value was obtained for bodily condylar movement from rest position to the retrusive position, it would seem that a definite retrusive range from rest position does exist in the edentulous.

*(Additional abstracts presented before the Research Section of the American Association of Orthodontists in May, 1955, will appear from time to time in forthcoming issues of the Journal.)*

# News and Notes

## 1956 Prize Essay Contest, American Association of Orthodontists

*Eligibility.*—Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry or associated with it as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

*Character of Essay.*—Each essay submitted must represent an original investigation and contain some new significant material of value to the art and science of orthodontics.

*Prize.*—A cash prize of $500.00 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if, in its judgment, none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

*Specifications.*—All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced with at least 1 inch margins. Each sheet must be numbered and bound or assembled with paper fasteners in a "brief cover" for easy handling. Three complete copies of each essay, including all illustrations, tables, and bibliography, must be submitted. The name and address of the author must not appear in the essay. For purpose of identification, the author's name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.) should be typed on a separate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

*Presentation.*—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held at the Statler Hotel, Boston, Massachusetts, the week of April 29, 1956.

*Judges.*—The entries will be judged by the Research Committee of the American Association of Orthodontists.

*Final Submission Date.*—No essay will be considered for this competition unless received in triplicate on or before Jan. 10, 1956, by Dr. Thomas D. Speidel, University of Minnesota, School of Dentistry, Minneapolis 14, Minnesota.

H. I. Margolis, Chairman, Research Committee
American Association of Orthodontists
311 Commonwealth Ave.
Boston 15, Massachusetts

## American Association of Orthodontists, 1956 Research Section Meeting

Continuing the policy of recent years, the program will consist of a series of ten-minute research reports which may be presented orally or read by title only. All persons engaged in research are urged to participate in this program, which will be held on April 29 and 30 and May 1 and 2, 1956, in the Statler Hotel, Boston, Massachusetts.

Each participant is asked to prepare a 250-word abstract for publication in the AMERICAN JOURNAL OF ORTHODONTICS. Abstract for publication and the ten-minute oral presentation at the meeting should be carefully prepared to present an adequate description of the import of your investigation.

Forms for use in submitting the title and 250-word abstract of your research will be sent to each dental school orthodontic department and to any individual requesting one. Please send your title and abstract as early as possible, but not later than Jan. 10, 1956, to Dr. J. William Adams, 707 Bankers Trust Bldg., Indianapolis 4, Indiana.

H. I. Margolis, Chairman, Research Committee
American Association of Orthodontists
311 Commonwealth Ave.
Boston 15, Massachusetts

## American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Statler Hotel in Boston, Massachusetts, April 24 through April 28, 1956. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. Wendell L. Wylie, University of California School of Dentistry, The Medical Center, San Francisco 22, California.

Applications for acceptance at the Boston meeting, leading to stipulation of examination requirements for the following year, must be filed before March 1, 1956. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least three years.

## Rocky Mountain Society of Orthodontists

The thirty-fifth annual fall meeting of the Rocky Mountain Society of Orthodontists was held in Denver, Colorado, on Nov. 14 and 15, 1955, with the following program:

Extraoral Force, Habits. Thomas Graber.
Appliances. Alexander Sved.
Economics. Gerald P. Peters.

Officers of the Society are: *President,* Walter K. Appel; *Vice-President,* Richard Harshman; *Secretary-Treasurer,* Howard L. Wilson.

## United States Department of Health, Education, and Welfare

Dr. J. Roy Doty of Chicago, secretary of the Council on Therapeutics, American Dental Association, has been appointed to serve on the National Advisory Dental Research Council, according to an announcement by Surgeon General Leonard A. Scheele of the Public Health Service, United States Department of Health, Education, and Welfare.

As a member of the National Advisory Council, Dr. Doty will advise and make recommendations to the Surgeon General regarding activities of the National Institute of Dental Research, Bethesda, Maryland. This is one of the seven institutes which make up the National Institutes of Health, main research branch of the Public Health Service. Dr. Doty will serve a four-year term, beginning Oct. 1, 1955.

The National Advisory Dental Research Council was established by an act of Congress in 1948. Upon recommendations of the Council, the Surgeon General awards grants to universities, dental schools, and other non-federal institutions conducting research on diseases of the mouth and the teeth. The Surgeon General can award grants only upon Council recommendation.

## Committee on Child Health, American Public Health Association

Four basic guides to methods of community care for handicapped children were issued October 1 by the American Public Health Association. These basic reference manuals represent six years of work by over 200 leading specialists in the medical, rehabilitation, and public health fields, working in collaboration with a special subcommittee of the Committee on Child Health of the American Public Health Association.

The four guides have been endorsed by leading national professional organizations concerned with the health and welfare of handicapped children. They draw together significant facts and new ideas and make them available in concise form; they show how service standards have changed as research has opened new techniques and methods of prevention and treatment. "We believe these guides will help workers in the field close the gap between what we know about the many needs of the handicapped child and what we are doing to meet them," Dr. Samuel M. Wishik, chairman of the Committee on Child Health, said.

The basic guide, *Services for Handicapped Children,* deals with problems common to various handicapping conditions. It outlines principles and practices to make the most of existing facilities or to aid in establishing services where these are poorly organized or lacking altogether.

Three other guides which show how these general principles and practices can be used in planning services for children with such special problems are *Cerebral Palsy, Cleft Lip and Cleft Palate,* and *Dento-Facial Handicaps.* These will be followed in the next two years by other guides covering such problems as diabetes, emotional disturbances, epilepsy, hearing impairment, heart disease and rheumatic fever, orthopedic and neuromuscular handicaps, and visual impairment.

*How to Stretch Budgets.*—The manuals are prepared for a field where budgets vary from a few cents to over $2.00 per capita in different localities. They show how to stretch scanty dollars and personnel over rural roads and crowded city neighborhoods in order to find and serve children in time to prevent the worst effects of a handicapping condition. The major theme of all the guides is how to build a pattern of special services by making maximum use of existing community facilities. Dozens of specific methods to this end are proposed; for example, a section on education shows how special equipment and special privileges can open the facilities of public schools to many handicapped children.

"Perhaps the guide has served its purpose in making us realize what can be done with the facilities we have," said the director of a state division of dental health after reviewing the guide dealing with dento-facial handicaps.

*The Teamwork Approach.*—The guides reflect the movement away from single-category programs, which sometimes mean inefficient use of funds and duplication of efforts. They show how community-wide programs can make use of existing "special" services, as provided by both voluntary and public agencies, to serve children with many kinds of handicapping conditions. How to bring specialists in private practice into the community program, how to set up noncategory standards of admission, how to integrate the services of hospital outpatient clinics with the other health services of the community—these are only a few of the many specific steps to a coordinated community-wide program which are considered.

The guides show how to undertake the kind of planning that will bring every resource in the community into use, creating, in effect, a coordinated "rehabilitation center." Within this over-all pattern, each special clinic and special service for a specific handicapping condition can pool its resources with regular community health facilities to serve a maximum number of children at a lower unit cost.

*Timing and Kinds of Services.*—Coordination of community services and facilities is basic to the "teamwork" approach to treatment of the handicapped child. The guides recognize that the handicapped child is a child with many needs. They outline the kinds of services that will meet these needs while providing whatever direct treatment is possible for the

specific disability. Thus, they deal with such key problems as the kinds and timing of direct services and show how to relate both treatment and services to the child's pattern of growth.

A clinical orthopedist in a teaching center, after reviewing the guide covering cerebral palsy, said, "This is a remarkably lucid and well-organized document, and I have absolutely no additions or revisions to suggest. This is the first time in my experience with cerebral palsy and its literature that I have been able to make such a comment."

*Standards to Be Adapted to Fit Community Needs.*—The guides cover new facts about handicapped children, the causes and prevention of handicaps, finding children who need services, diagnosis and planning for care, treatment and guidance, special services and facilities, organization of community resources, community education, personnel, research, program study, and evaluation. In addition, appendices provide such material as a check list of questions to be used in evaluating programs, check-list charts of services and interagency relationships, sample procedures in a diagnostic clinic, qualifications for specialists and consultants, etc.

The Committee on Child Health of the American Public Health Association undertook this study in 1949, Dr. Wishik said, because "much of the prevailing information about the needs of children was inaccurate, and often the best knowledge was unavailable to those who could use it. Significant facts needed to be drawn together, discussion provoked, opinions formulated, and agreement reached on how children may best be served through community action."

While representing agreement of leading authorities in the special fields covered, the guides are not, Dr. Wishik also pointed out, "statements of inflexible standards. They will serve their intended function only where they are adapted to fit specific community needs and situations."

*Endorsement by National Agencies.*—Advisory groups composed of doctors, nurses, educators, social workers, administrators, and members of endorsing organizations collaborated with the Committee on Child Health in preparing the guides. In addition to the work of the advisory groups, Dr. Wishik said, "a great deal of concrete help was received from the staffs of state and territorial health departments and the Children's Bureau, and from members of the American Academy of Pediatrics' Committee on Mentally and Physically Handicapped Children, and the Association of State Maternal and Child Health and Crippled Children's Directors." Many of these groups have endorsed the publications, as have the American School Health Association and International Council for Exceptional Children.

The American Academy of Cerebral Palsy joined with the Committee on Child Health in preparing the special guide in this field. The guide dealing with cleft lip and cleft palate, in addition to endorsement by most of the groups mentioned, has also been endorsed by the American Association for Cleft Palate Rehabilitation, the American Association of Orthodontists, and the American Dental Association.

The years of study whose results are condensed in these publications were made possible by grants from the Association for the Aid of Crippled Children and the New York Fund for Children. Publication was made possible by a grant from the Ittleson Family Foundation.

The publications are priced at $1.50 each, or at a special price of $5.10 for the set of four. Orders should be addressed to: Committee on Child Health, American Public Health Association, 1790 Broadway, New York 19, New York.

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## Spanish Association of Orthodontics

The first meeting of the Spanish Association of Orthodontics was held in Barcelona, Spain, March 25 to 27, 1955, under the presidency of Dr. Costa del Rio of Barcelona.

The opening speech was delivered by Dr. Pedro Planas, Madrid, who briefly outlined the principles and aims of the Association, emphasizing the importance of the first meeting. He ended his speech by evoking the devotion and tireless services to the profession of Dr. Luis Subirana Matas, who was the first professor of orthodontics in Spain.

Dr. Tomé of Madrid read many letters and telegrams of solidarity to the meeting, which were received from individuals and societies. Prominent among them were those received from the president of the College of Odontists and Stomatologists, from the Portugese Association of Stomatology, from the National Syndicate of Portugese Odontists, from the director of the School of Stomatology in Madrid (Dr. Zabala), and from Dr. Mañes, professor at the School of Stomatology.

The magistral address was delivered by Dr. Costa del Rio, who spoke on "The Present Situation of Orthodontics in Europe."

The scientific program was as follows:

*March 25, 1955*

A Report on the Stomatologic Examination of a Thousand Children Between the Ages of 6 and 16, Valencia, Spain. A. J. Cervera Duran, Valencia.

Some Cases of Supernumerary Teeth. N. Molleda Medrano, Barcelona.

Disdaquia Due to Lateral Supernumerary. J. Queral Fabregas, Barcelona.

Bimler's Apparatus (Progeny) and Support or Sustainer of Occlusion. J. Carol Murillo, Barcelona.

Dimorphosis or Anomalies Due to Oral Frenums. Comments on Esthetics. J. Arostegui Barbier, Bilbao.

*Films:*

(1) Planas' Gnathostatic Technique. Planas Casanovas.

(2) Active and Functional Orthodontics by Means of Mobile Apparatus: Plates, Activators, and Occlusion Formers. H. Stockfisch.

*March 26, 1955*

Demonstrations on Patients Under Orthodontic Treatment at the Orthodontical Section of Dental Hygiene for School Children Dependent on the Municipal Institute of Education of Barcelona. Costa del Rio and Carol Murillo.

Functional Orthodontics. E. Carreras Bossa, Barcelona.

Some Concise Accounts on Dental Migration in Relation to Orthodontics. J. Bacao Leal, Lisbon.

Presentation of a Case of Uncommon Dilatation. J. Pericot Garcia, Barcelona.

Orthodontics in Mixed Dentition. A. Serraller Carral, Barcelona.

Different Applications of Coil Springs in Orthodontics. F. Ramon Amat, Barcelona.

Spring With Sliding Guides for Expanding, Distalling, etc. J. Blasco Meras, Valencia.

The Nasal Cavity and Orthodontics. E. Marti Fabregat, Tortosa.

Related Aspects of Periodontics and Orthodontics. J. Lobera Rubio, Zaragoza.

How We Must Begin and Finish the Orthodontic Treatment. P. Planas Casanovas, Madrid.

*Table Demonstrations:*

Planas' Gnathostat. Functional Appliances. My Recorder of Balanced Occlusion. Planas' Cephalostat. P. Planas Casanovas, Madrid.

Prof. Gerlach's Cast Formers. The Articulator, Facial Bow and Brandup-Wongsen Recorder. A. J. Cervera Duran, Valencia.

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Different Types of Edgewise in Tweed's Technique. A. Serraller Carral, Barcelona.

Some Orthodontic Cases With Their Rights and Wrongs. L. Larriu Ascorbe, Pamplona.

Orthodontic Practice With Activator, Projector, Kinetor, and Model Maker. H. Stockfisch, Stuttgart.

Eclectical Apparatus in Orthodontics. C. Costa del Rio, Barcelona.

Later in the evening of March 26 the general meeting of the Spanish Association of Orthodontics was held. All those who had presented some scientific work in this first meeting were admitted as titular members of the Society. The meeting was closed with a dinner, followed by several speeches.

*March 27, 1955*

On Sunday, after hearing a Mass for the soul of Luis Subirana Matas, the group went for a trip along the Costa Brava.

The second meeting of the Spanish Association of Orthodontics will be held about the middle of May, 1956. Since Dr. P. Planas has been appointed president of the twenty-ninth meeting of the Société Française D'Orthopédie Dento-Faciale, both meetings will be held at one and the same time in Madrid.

In addition to 100 Spanish and 200 French colleagues who will come to the meeting in Madrid, many orthodontists from other countries promised to attend. Among them are some of the principal European masters who are considered as the "great patriarchs" of functional orthodontics. Portugal, Belgium, Holland, Germany, Sweden, Norway, Italy, Great Britain, Switzerland, and Argentina, to mention a few, will be represented. We shall be very pleased if a large number of American orthodontists come to the meeting and contribute with their table demonstrations to explain the basic principles of the American school of orthodontics. We think that, apart from the scientific interest of the meeting, the excellent tourist attractions of Madrid will be taken into account, including bullfights, visits to el Escorial, Toledo, Museo del Prado, etc.

A. J. Cervera Duran
Avenida del Oeste, 29
Valencia, Spain

## Notes of Interest

Drs. J. O. Baker and R. E. Baker announce that Dr. Donald H. Renneke is now associated with them in their practice of orthodontics, Lowry Medical Arts Bldg., St. Paul, Minnesota.

Ralph W. Hodges, D.D.S., announces the resumption of his practice, which is limited to orthodontics, at 735 Farmington Ave., West Hartford, Connecticut, as of Nov. 15, 1955.

Seymour Levin, D.D.S., announces that, in addition to being at 716 Main St., Poughkeepsie, New York, he will be at 36 East Main St., Beacon, New York, on Wednesdays, practice limited to orthodontics.

Nathan L. McGill, D.D.S., 7171 Manchester Ave., Maplewood, Missouri, announces the limitation of his practice to orthodontics.

John C. Stanton, D.D.S., announces that he is assuming the practice of the late Roger Prosser, D.D.S., at 407 South Kentucky Ave., Lakeland, Florida, practice limited to orthodontics.

Benjamin Weiss, D.D.S., and Martin L. Dean, D.M.D., announce the return from military service of their former associate, Jay K. Weiss, D.M.D., to their practice of orthodontics in the Medical Tower Building, Newark, New Jersey.

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